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DOT's Federal Pipeline Safety Program: Background and Key Issues for Congress

Updated July 7, 2016

Congressional Research Service
https://crsreports.congress.gov
R44201

CRS REPORT
Prepared for Members and
Committees of Congress

Summary

The U.S. energy pipeline network is composed of over 2.9 million miles of pipeline transporting natural gas, oil, and other hazardous liquids. Recent accidents in Michigan, Arkansas, and California have drawn criticism from the National Transportation Safety Board and have raised congressional concern about pipeline risks. The Department of Energy's (DOE's) *Quadrennial Energy Review* also highlighted pipeline safety as an issue for the nation's energy infrastructure. Trends in pipeline accidents suggest there continues to be opportunity for safety improvement.

The federal pipeline safety program resides within the Department of Transportation's Pipeline and Hazardous Materials Safety Administration (PHMSA), although its inspection and enforcement activities rely heavily upon state partnerships. Some in Congress have criticized inspector staffing at PHMSA as being insufficient to cover all pipelines under the agency's jurisdiction. Funding for inspectors at PHMSA has grown significantly in recent years. For FY2016, PHMSA's total budget authority is approximately $147 million—more than double the agency's budget authority in FY2006. But PHMSA has a record of persistent understaffing relative to its funding. Filling inspector positions poses practical challenges for the agency.

A recent natural gas leak at the Aliso Canyon Underground Storage Facility in California released 5.4 billion cubic feet of natural gas and caused the temporary relocation of over 2,000 households and two schools. Both the occurrence of the leak, and the length of time it took to stop it, raised concerns about the risks of such facilities and about state regulations to insure their safety. The DOE and PHMSA have since announced an interagency task force to "initiate regulatory actions to help ensure the safety of natural gas storage facilities."

PHMSA has yet to complete key regulatory mandates imposed by the Pipeline Safety Act of 2011, including mandates related to automatic shutoff valves, integrity management expansion, leak detection, and maximum allowable operating pressure. Congress has expressed frustration with the agency's failure to fulfill these mandates. Other issues of concern include the regulation of gathering lines, the effectiveness of PHMSA's safety enforcement, aging gas distribution pipelines, and new methane emissions rules from the Environmental Protection Agency.

To authorize the federal pipeline safety program through FY2019, President Obama signed the SAFE PIPES Act (P.L. 114-183) on June 22, 2016. The act authorizes appropriations for FY2017 slightly higher than in FY2016 with small annual increases thereafter. Among other provisions, the act requires PHMSA to promulgate federal safety standards for underground natural gas storage facilities and would grant PHMSA emergency order authority to address urgent "industry-wide safety conditions" without prior notice. The act also requires PHMSA to report regularly on the progress of outstanding statutory mandates.

Whether ongoing efforts by industry, combined with additional resources for PHMSA and new regulations, will enhance the safety of U.S. pipelines remains to be seen. Pipeline safety necessarily involves many groups: federal and state agencies, pipeline associations, pipeline operators, and local communities. Reviewing how these groups work together to achieve common goals could be an overarching concern for Congress.

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Introduction

The U.S. energy pipeline network is integral to the nation's energy supply and provides vital links to other critical infrastructure, such as power plants, airports, and military bases. These pipelines are geographically widespread, running alternately through remote and densely populated regions—from Arctic Alaska to the Gulf of Mexico and nearly everywhere in between. Because these pipelines carry volatile, flammable, or toxic materials, they have the potential to cause public injury, property destruction, and environmental damage. Although they are generally an efficient and comparatively safe means of transport, pipeline systems are nonetheless vulnerable to accidents and operational failure. A series of recent accidents in Michigan, California, and Arkansas, among other places, have demonstrated this vulnerability and have heightened congressional concern about U.S. pipeline safety. The Department of Energy's first *Quadrennial Energy Review* (QER), released in April 2015, also highlighted pipeline safety as a growing concern for the nation's energy infrastructure.[1]

The federal program for pipeline safety resides primarily within the Department of Transportation's (DOT's) Pipeline and Hazardous Materials Safety Administration (PHMSA), although its inspection and enforcement activities rely heavily upon partnerships with the states. Together, the federal and state pipeline safety agencies administer a comprehensive set of regulatory authorities which has changed significantly over the last decade and continues to do so. This report reviews the history of federal programs for pipeline safety, discusses significant safety issues, and summarizes recent developments focusing on key issues for Congress. Although related to safety, pipeline security is not under PHMSA's jurisdiction and is outside the scope of this report.

The federal pipeline safety program was last authorized through the fiscal year ending September 30, 2015, under the Pipeline Safety, Regulatory Certainty, and Job Creation Act of 2011 (P.L. 112-90). The program was funded through fiscal year (FY) 2016 under the Consolidated Appropriations Act of 2016 (P.L. 114-113 §171). To authorize the program through FY2019, the President signed the SAFE PIPES Act (P.L. 114-183) on June 22, 2016.

The U.S. Pipeline Network

The U.S. energy pipeline network is composed of over 2.9 million miles of pipeline transporting natural gas, oil, and hazardous liquids (**Table 1**). Of the nation's approximately half million miles of long-distance transmission pipeline, roughly 200,000 miles carry hazardous liquids—over 70% of the nation's crude oil and refined petroleum products, along with other products.[2] The U.S. natural gas pipeline network consists of around 300,000 miles of *inter*state and *intra*state transmission. It also contains some 240,000 miles of field and gathering pipeline, which connect gas extraction wells to processing facilities. With some 7% of gathering lines are currently under federal regulation (discussed later in this report), the total mileage of U.S. gathering lines is not known precisely. Few state agencies collect this information. The natural gas transmission pipelines feed around 2.2 million miles of regional pipelines in some 1,400 local distribution networks serving over 67 million customers.[3] Natural gas pipelines also connect to 115 active

[1] Department of Energy, *Quadrennial Energy Review: Energy Transmission, Storage, and Distribution Infrastructure* (QER), April 2015, p. S-5.

[2] Association of Oil Pipelines, Pipeline 101, "Other Means of Transport," web page, March 21, 2016, http://www.pipeline101.com/why-do-we-need-pipelines/other-means-of-transport.

[3] Pipeline and Hazardous Materials Safety Administration (PHMSA), "Annual Report Mileage for Gas Distribution

liquefied natural gas (LNG) storage sites, as well as underground storage facilities, which can augment pipeline gas supplies during peak demand periods.[4]

Table 1. U.S. Hazardous Liquid and Natural Gas Pipeline Mileage 2014

Category	Miles
Hazardous Liquids	199,642
Natural Gas Gathering (federal)	17,517
Natural Gas Gathering (state)	223,000
Natural Gas Transmission	301,816
Natural Gas Distribution Mains and Service Lines	2,168,835
TOTAL	**2,910,810**

Sources: PHMSA, "Annual Report Mileage Summary Statistics," web tables, March 1, 2016, http://www.phmsa.dot.gov/portal/site/PHMSA/menuitem.7c371785a639f2e55cf2031050248a0c/?vgnextoid=3b6c03347e4d8210VgnVCM1000001ecb7898RCRD&vgnextchannel=3b6c03347e4d8210VgnVCM1000001ecb7898RCRD&vgnextfmt=print; and "Gathering Pipelines: Frequently Asked Questions," web page, March 21, 2016, http://phmsa.dot.gov/portal/site/PHMSA/menuitem.6f23687cf7b00b0f22e4c6962d9c8789/?vgnextoid=4351fd1a874c6310VgnVCM1000001ecb7898RCRD&vgnextchannel=f7280665b91ac010VgnVCM1000008049a8c0RCRD&vgnextfmt=print#QA_2.

Notes: Hazardous liquids primarily include crude oil, gasoline, jet fuel, diesel fuel, home heating oil, propane, and butane. Other hazardous liquids transported by pipeline include anhydrous ammonia, carbon dioxide, kerosene, liquefied ethylene, and some petrochemical feedstocks. State regulated natural gas gathering line mileage is based on PHMSA estimates.

Safety in the Pipeline Industry

Accidental pipeline releases can result from a variety of causes, including third-party excavation, corrosion, mechanical failure, control system failure, and operator error. Natural forces, such as floods and earthquakes, can also damage pipelines. Taken as a whole, releases from pipelines cause few annual injuries or fatalities compared to other product transportation modes.[5] According to PHMSA, there were 13 deaths and 59 injuries annually caused by 33 pipeline incidents on average in all U.S. pipeline systems from 2006 through 2015.[6] This overall accident trend has declined on the whole since 2005, although it reached its low in 2013 and has risen the last two years (**Figure 1**).

Systems," web table, March 1, 2016, http://www.phmsa.dot.gov/pipeline/library/data-stats/annual-report-mileage-for-gas-distribution-systems.

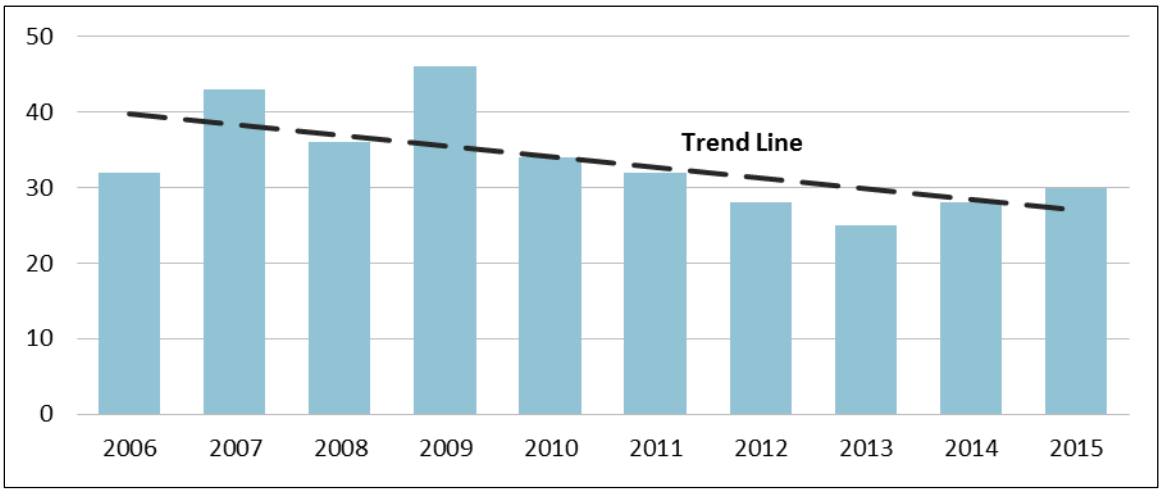
[4] PHMSA, "Liquefied Natural Gas (LNG) Facilities and Total Storage Capacities," web table, August 3, 2015, http://www.phmsa.dot.gov/pipeline/library/data-stats/liquefied-natural-gas-lng-facilities-and-total-storage-capacities.

[5] Bureau of Transportation Statistics, "Table 2-4: Distribution of Transportation Fatalities by Mode," web table, 2016, http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/national_transportation_statistics/html/table_02_04.html; and "Table 2-2: Injured Persons by Transportation Mode," web table, 2016, http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/national_transportation_statistics/html/table_02_02.html_mfd.

[6] PHMSA, "PHMSA Pipeline Incidents: (1996-2015), web table, March 22, 2016, https://hip.phmsa.dot.gov/analyticsSOAP/saw.dll?Portalpages.

Figure 1. Accidents Causing Injuries or Fatalities, 10-Year Trend

(Annual "Serious" Incidents)



Source: PHMSA, "PHMSA Pipeline Incidents: Count (1996-2015)," web chart, March 22, 2016, https://hip.phmsa.dot.gov/analyticsSOAP/saw.dll?Portalpages&NQUser=PDM_WEB_USER&NQPassword=Public_Web_User1&PortalPath=%2Fshared%2FPDM%20Public%20Website%2F_portal%2FSC%20Incident%20Trend&Page=Serious&Action=Navigate&col1=%22PHP%20-%20Geo%20Location%22.%22State%20Name%22&val1=%22%22.

Note: PHMSA defines "serious" incidents as those including a fatality or injury requiring inpatient hospitalization.

Apart from injury to people, some accidents may cause environmental damage or other physical impacts which may be significant—particularly in the case of oil spills or fires. PHMSA requires the reporting of such incidents involving

- $50,000 or more in total costs, measured in 1984 dollars,
- highly volatile liquid releases of 5 barrels or more or other liquid releases of 50 barrels or more, or
- liquid releases resulting in an unintentional fire or explosion.[7]

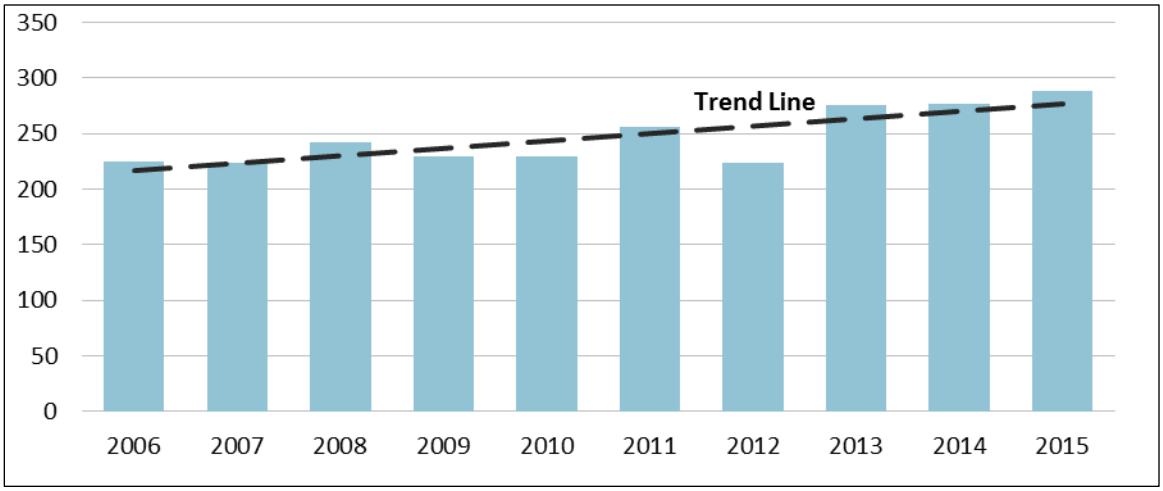
On average there were 247 such "significant" incidents (not involving injury or fatality) per year from 2006 through 2015. Unlike the trend for incidents harming people, the trend for incidents affecting only the environment or property has been generally rising over the last decade (**Figure 2**). It should be noted, however, that federally regulated pipeline mileage rose approximately 10% over this period, so both injury and environmental incidents would show flatter trend lines on a per-mile basis over the last decade.[8]

[7] PHMSA, "Pipeline Incident Flagged Files," web page, March 22, 2016, http://www.phmsa.dot.gov/pipeline/library/datastatistics/flagged-data-files. The definition excludes natural gas distribution incidents caused by a nearby fire or explosion impacting the pipeline system.

[8] For detailed annual pipeline mileage statistics, see PHMSA, "Annual Report Mileage Summary Statistics," web page, March 1, 2016, http://www.phmsa.dot.gov/pipeline/library/data-stats/annual-report-mileage-for-gas-distribution-systems.

Figure 2. Accidents Causing Environmental or Property Damage, 10-Year Trend

(Annual "Significant" Incidents)



Source: PHMSA, "Pipeline Significant Incident 20 Year Trend," web table, , March 22, 2016, https://hip.phmsa.dot.gov/analyticsSOAP/saw.dll?Portalpages&NQUser=PDM_WEB_USER&NQPassword=Public_Web_User1&PortalPath=%2Fshared%2FPDM%20Public%20Website%2F_portal%2FSC%20Incident%20Trend&Page=Significant&Action=Navigate&col1=%22PHP%20-%20Geo%20Location%22.%22State%20Name%22&val1=%22%22.

Note: Excludes "serious" incidents causing a fatality or injury requiring inpatient hospitalization.

Although pipeline releases have caused relatively few fatalities in absolute numbers, a single pipeline accident can be catastrophic in terms of public safety and environmental damage. Notable pipeline accidents in recent years include the following:

- **2010—**A pipeline spill in Marshall, MI, released 819,000 gallons of crude oil into a tributary of the Kalamazoo River.
- **2010**—A natural gas pipeline explosion in San Bruno, CA, killed 8 people, injured 60 others, and destroyed 37 homes.
- **2011—**A natural gas pipeline explosion in Allentown, PA, killed 5 people, damaged 50 buildings, and caused 500 people to be evacuated.
- **2011—**A pipeline spill near Laurel, MT, released an estimated 42,000 gallons of crude oil into the Yellowstone River.
- **2012**—A natural gas pipeline explosion in Springfield, MA, injured 21 people and heavily damaged over a dozen buildings.
- **2013**—An oil pipeline spill in Mayflower, AK, spilled 5,000 barrels of crude oil in a residential community causing 22 homes to be evacuated.
- **2014**—A natural gas distribution pipeline explosion in New York City killed 8 people, injured 50 others, and destroyed 2 5-story buildings.
- **2015**—A pipeline in Santa Barbara County, CA, spilled 3,400 barrels of crude oil, including 500 barrels reaching Refugio State Beach on the Pacific Ocean.

Such accidents have generated persistent scrutiny of pipeline regulation and have increased state and community activity related to pipeline safety.

Pipeline Security

In addition to their vulnerability to accidents, pipelines may also be intentionally damaged by vandals or terrorists. Pipelines may be vulnerable to "cyber-attacks" on supervisory control and data acquisition (SCADA) systems or attacks on electricity grids and communications networks. Although pipeline safety and security are related, pipeline security is under the authority of the Department of Homeland Security and outside the scope of this report.[9]

Federal Agencies in Pipeline Safety

Three federal agencies play the most significant roles in the formulation, administration, and oversight of pipeline safety regulations in the United States. As stated above, PHMSA (within DOT) has the primary responsibility for the promulgation and enforcement of federal pipeline safety standards. The Federal Energy Regulatory Commission (FERC) is not operationally involved in pipeline safety, but it examines safety issues under its siting authority for interstate natural gas pipelines. The National Transportation Safety Board (NTSB) investigates transportation accidents—including pipeline accidents—and issues associated safety recommendations. These agency roles are discussed in the following sections.

Pipelines and Hazardous Materials Safety Administration

The Natural Gas Pipeline Safety Act of 1968 (P.L. 90-481) and the Hazardous Liquid Pipeline Act of 1979 (P.L. 96-129) are two of the principal early acts establishing the federal role in pipeline safety. Under both statutes, the Transportation Secretary is given primary authority to regulate key aspects of interstate pipeline safety: design, construction, operation and maintenance, and spill response planning. Pipeline safety regulations are covered in Title 49 of the *Code of Federal Regulations*.[10]

As of May 2, 2016, PHMSA employed 266 staff, including 131 inspectors as well as enforcement and support personnel.[11] In addition to its own staff, PHMSA's enabling legislation allows the agency to delegate authority to *intra*state pipeline safety offices, and allows state offices to act as "agents" administering *inter*state pipeline safety programs (excluding enforcement) for those sections of *inter*state pipelines within their boundaries.[12] According to the DOT, "PHMSA leans heavily on state inspectors for the vast network of intrastate lines," and a few states serve as agents for inspection of interstate pipelines as well.[13] There were approximately 340 full-time equivalent (FTE) state pipeline safety inspectors in 2015.[14]

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[9] For discussion of the federal pipeline security program, see CRS Testimony TE10009, *Pipelines: Securing the Veins of the American Economy*, by Paul W. Parfomak, April 19, 2016.

[10] Safety and security of liquefied natural gas (LNG) facilities used in gas pipeline transportation is regulated under C.F.R. Title 49, Part 193.

[11] Pipeline and Hazardous Materials Safety Administration, "PHMSA Pipeline Safety Program," organizational chart, May 2, 2016, http://www.phmsa.dot.gov/pv_obj_cache/pv_obj_id_79950CC44CFF00142BB2ABBBE5039F4406980300/filename/ops_orgchart.pdf. This figure assumes all staff are full-time equivalent employees and accounts for one known vacancy.

[12] 49 U.S.C. 60107.

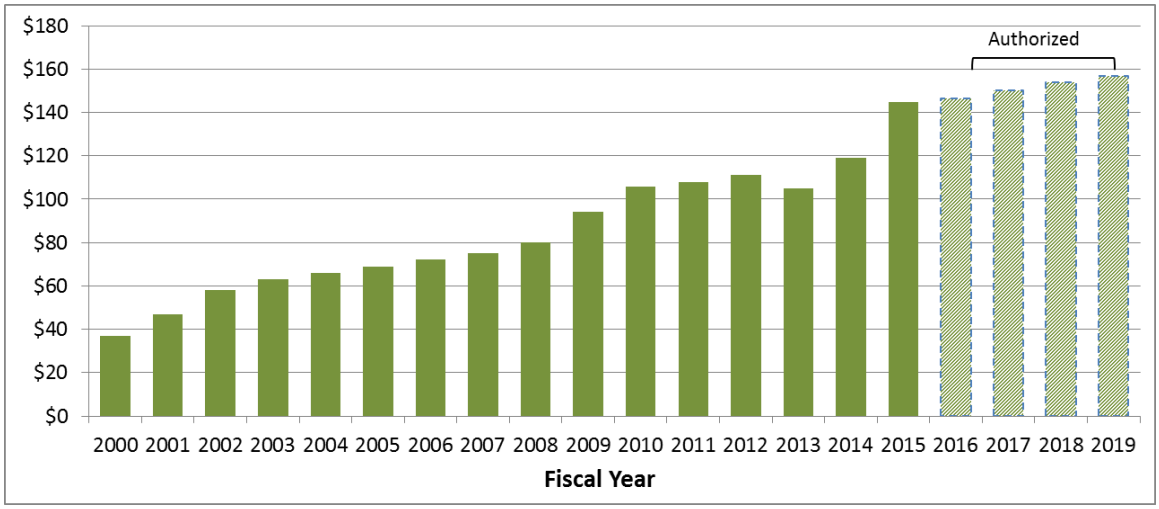
[13] U.S. Department of Transportation, *Budget Estimates Fiscal Year 2017, Pipeline and Hazardous Materials Safety Administration*, 2017, p. 54, https://www.transportation.gov/sites/dot.gov/files/docs/PHMSA-FY-2017-CJ.pdf.

[14] Patricia Klinger, Pipeline and Hazardous Materials Safety Administration, personal communication, May 18, 2016.

PHMSA's pipeline safety program is funded primarily by user fees assessed on a per-mile basis on each regulated pipeline operator.[15] The agency's total annual budget authority has grown fairly steadily since 2000, with the most significant increase in FY2015 (**Figure 3**). For FY2016, under P.L. 114-183, PHMSA's total budget authority is approximately $147 million—more than double the agency's budget authority in FY2006.

Figure 3. PHMSA Pipeline Safety Total Annual Budget Authority 2000-2017

(Millions of Dollars)



Source: U.S. Office of Management and Budget, *Budget of the United States Government, Appendix*, Fiscal Years 2002 through 2016, Line 1900 "Budget authority (total)."

Notes: Column values are "actual" budget totals except for 2016 and 2017 as indicated. Values are not adjusted for inflation.

PHMSA uses a variety of strategies to promote compliance with its safety standards. The agency conducts programmatic inspections of management systems, procedures, and processes; conducts physical inspections of facilities and construction projects; investigates safety incidents; and maintains a dialogue with pipeline operators. The agency clarifies its regulatory expectations through published protocols and regulatory orders, guidance manuals, and public meetings. PHMSA relies upon a range of enforcement actions, including administrative actions such as corrective action orders (CAOs) and civil penalties, to ensure that operators correct safety violations and take measures to preclude future safety problems. From 2011 through 2015, PHMSA initiated about 1,100 enforcement actions against pipeline operators.[16] Civil penalties proposed by PHMSA for safety violations during this period totaled approximately $28 million.[17] PHMSA also conducts accident investigations and system-wide reviews focusing on high-risk operational or procedural problems and areas of the pipeline near sensitive environmental areas, high-density populations, or navigable waters.

[15] 49 U.S.C. 60125.

[16] Pipeline and Hazardous Material Safety Administration (PHMSA), "PHMSA Pipeline Safety Program: Summary of Enforcement Actions," web page, March 2, 2106, http://primis.phmsa.dot.gov/comm/reports/enforce/Actions_opid_0.html?nocache=8828.

[17] Pipeline and Hazardous Material Safety Administration (PHMSA), "PHMSA Pipeline Safety Program: Summary of Cases Involving Civil Penalties," web page, March 2, 2016, http://primis.phmsa.dot.gov/comm/reports/enforce/CivilPenalty_opid_0.html?nocache=9288#_TP_1_tab_1. Proposed penalties may change in the resolution of a case.

Since 1997, PHMSA has increasingly required industry's implementation of "integrity management" programs on pipeline segments near "high consequence areas." Integrity management provides for continual evaluation of pipeline condition; assessment of risks to the pipeline; inspection or testing; data analysis; and follow-up repair; as well as preventive or mitigative actions. High consequence areas (HCAs) include population centers, commercially navigable waters, and environmentally sensitive areas, such as drinking water supplies or ecological reserves. The integrity management approach prioritizes resources to locations of highest consequence rather than applying uniform treatment to the entire pipeline network. PHMSA made integrity management programs mandatory for most oil pipeline operators with 500 or more miles of regulated pipeline as of March 31, 2001 (49 C.F.R. §195). Congress subsequently mandated the expansion of integrity management to natural gas pipelines, along with other significant changes to federal pipeline safety requirements, through a series of agency budget reauthorizations as discussed below.

Pipeline Safety Improvement Act of 2002

On December 12, 2002, President George W. Bush signed into law the Pipeline Safety Improvement Act of 2002 (P.L. 107-355). The act strengthened federal pipeline safety programs, state oversight of pipeline operators, and public education regarding pipeline safety.[18] Among other provisions, P.L. 107-355 required operators of regulated natural gas pipelines in high-consequence areas to conduct risk analysis and implement integrity management programs similar to those required for oil pipelines.[19] The act authorized DOT to order safety actions for pipelines with potential safety problems and increased violation penalties. The act streamlined the permitting process for emergency pipeline restoration by establishing an interagency committee, including the DOT, the Environmental Protection Agency, the Bureau of Land Management, the Federal Energy Regulatory Commission, and other agencies, to ensure coordinated review and permitting of pipeline repairs. The act required DOT to study ways to limit pipeline safety risks from population encroachment and ways to preserve environmental resources in pipeline rights-of-way. P.L. 107-355 also included provisions for public education, grants for community pipeline safety studies, "whistle blower" and other employee protection, employee qualification programs, and mapping data submission.

Pipeline Inspection, Protection, Enforcement, and Safety Act of 2006

On December 29, 2006, President Bush signed into law the Pipeline Inspection, Protection, Enforcement and Safety Act of 2006 (PIPES Act, P.L. 109-468). The main provisions of the act address pipeline damage prevention, integrity management, corrosion control, and enforcement transparency. The PIPES act created a national focus on pipeline damage prevention through grants to states for improving damage prevention programs, establishing 811 as the national "call before you dig" one-call telephone number, and giving PHMSA limited "backstop" authority to conduct civil enforcement against one-call violators in states that have failed to conduct such

[18] P.L. 107-355 encourages the implementation of state "one call" excavation notification programs (§2) and allows states to enforce "one-call" program requirements. The act expands criminal responsibility for pipeline damage to cases where damage was not caused "knowingly and willfully" (§3). The act adds provisions for ending federal-state pipeline oversight partnerships if states do not comply with federal requirements (§4).

[19] A 2006 Government Accountability Office (GAO) report found that PHMSA's gas integrity management program benefitted public safety, although the report recommended revisions to PHMSA's performance measures. See GAO, "Natural Gas Pipeline Safety: Integrity Management Benefits Public Safety, but Consistency of Performance Measures Should Be Improved," GAO-06-946, September 8, 2006, pp. 2-3.

enforcement. The act mandated the promulgation by PHMSA of minimum standards for integrity management programs for natural gas distribution pipelines.[20] It also mandated a review of the adequacy of federal pipeline safety regulations related to internal corrosion control, and required PHMSA to increase the transparency of enforcement actions by issuing monthly summaries, including violation and penalty information, and a mechanism for pipeline operators to make response information available to the public.

Pipeline Safety, Regulatory Certainty, and Job Creation Act of 2011

On January 3, 2012, President Obama signed the Pipeline Safety, Regulatory Certainty, and Job Creation Act of 2011 (Pipeline Safety Act, P.L. 112-90). The act contains a broad range of provisions addressing pipeline safety. Among the most significant are provisions to increase the number of federal pipeline safety inspectors, require automatic shutoff valves for transmission pipelines, mandate verification of maximum allowable operating pressure for gas transmission pipelines, increase civil penalties for pipeline safety violations, and mandate reviews of diluted bitumen pipeline regulation. Altogether, the act imposed 42 mandates on PHMSA regarding studies, rules, maps, and other elements of the federal pipeline safety program. As noted earlier, P.L. 112-90 authorized the federal pipeline safety program through the fiscal year ending September 30, 2015.

Federal Energy Regulatory Commission

One area related to pipeline safety not under PHMSA's primary jurisdiction is the siting approval of interstate natural gas pipelines, which is the responsibility of the Federal Energy Regulatory Commission (FERC). Companies building interstate natural gas pipelines must first obtain from FERC certificates of public convenience and necessity. (FERC does not oversee oil pipeline construction.) FERC must also approve the abandonment of gas facility use and services. These approvals may include safety provisions with respect to pipeline routing, safety standards, and other factors.[21] In particular, pipeline and aboveground facilities associated with a proposed pipeline project must be designed in accordance with PHMSA's safety standards regarding material selection and qualification, design requirements, and protection from corrosion.[22]

FERC and PHMSA cooperate on pipeline safety-related matters according to a Memorandum of Understanding (MOU) signed in 1993. According to the MOU, PHMSA agrees to

- promptly alert FERC when safety activities may impact commission responsibilities,
- notify FERC of major accidents or significant enforcement actions involving pipelines under FERC's jurisdiction,
- refer to FERC complaints and inquiries by state and local governments and the public about environmental or certificate matters related to FERC-jurisdictional pipelines, and
- when requested by FERC, review draft mitigation conditions considered by the commission for potential conflicts with PHMSA's regulations.

[20] PHMSA issued final regulations requiring operators of natural gas distribution pipelines to adopt integrity management programs similar to existing requirements for gas transmission pipelines on December 4, 2009.

[21] In making permitting decisions for cross-border oil and natural gas pipelines, the State Department or FERC, respectively, must also consult with the Secretary of Transportation regarding pipeline safety, among other matters, in accordance with directives in Executive Order 13337.

[22] U.S. Code of Federal Regulations, 18 C.F.R. 157.

Under the MOU, FERC agrees to

- promptly alert PHMSA when the commission learns of an existing or potential safety problem involving natural gas transmission facilities,
- notify PHMSA of future pipeline construction,
- periodically provide PHMSA with updates to the environmental compliance inspection schedule, and coordinate site inspections, upon request, with PHMSA officials,
- notify PHMSA when significant safety issues have been raised during the preparation of environmental assessments or environmental impact statements for pipeline projects, and
- refer to PHMSA complaints and inquiries made by state and local governments and the public involving safety matters related to FERC-jurisdictional pipelines.[23]

FERC may also serve as a member of PHMSA's Technical Pipeline Safety Standards Committee which determines whether proposed safety regulations are technically feasible, reasonable, cost-effective, and practicable.

In April 2015, FERC issued a policy statement to provide "greater certainty regarding the ability of interstate natural gas pipelines to recover the costs of modernizing their facilities and infrastructure to enhance the efficient and safe operation of their systems."[24] FERC's policy statement was motivated by the commission's expectation that governmental safety and environmental initiatives could soon cause greater safety and reliability costs for interstate gas pipeline systems.[25]

National Transportation Safety Board

The National Transportation Safety Board (NTSB) is an independent federal agency charged with determining the probable cause of transportation accidents (including pipeline accidents) and promoting transportation safety. The board's experts investigate significant accidents, develop factual records, and issue safety recommendations to prevent similar accidents from recurring. The NTSB has no statutory authority to regulate transportation, however, and it does not perform cost-benefit analyses of regulatory changes; its safety recommendations to industry or government agencies are not mandatory. Nonetheless, because of the board's strong reputation for thoroughness and objectivity, the average acceptance rate since 2010 for its safety recommendations is 73%.[26] The NTSB's "Most Wanted List" for 2013 called for enhanced pipeline safety through improved oversight of the pipeline industry.[27] In 2014, PHMSA took eight significant regulatory actions in response to NTSB safety recommendations.[28]

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[23] Department of Transportation and Federal Energy Regulatory Commission, Memorandum of Understanding Between the Department of Transportation and Federal Energy Regulatory Commission Regarding Natural Gas Transportation Facilities, January 15, 1993. Note that the MOU refers to DOT's Research and Special Programs Administration, the predecessor agency to PHMSA.

[24] Federal Energy Regulatory Commission (FERC), *Cost Recovery Mechanisms for Modernization of Natural Gas Facilities*, 151 FERC ¶ 61,047, April 16, 2015, http://www.ferc.gov/whats-new/comm-meet/2015/041615/G-1.pdf.

[25] Ibid., p. 1.

[26] National Transportation Safety Board (NTSB), *Annual Report to Congress 2014*, 2015, p. v.

[27] National Transportation Safety Board, "NTSB Most Wanted List: Enhance Pipeline Safety," November 2012.

[28] NTSB, 2015, p. 1. Regulatory actions include final rules, notices of proposed rulemaking, (NPRMs), advanced

San Bruno Pipeline Accident Investigation

In August 2011, the NTSB issued preliminary findings and recommendations from its investigation of the San Bruno Pipeline accident. The investigation included testimony from pipeline company officials, government agency officials (PHMSA, state, and local), as well as testimony from other pipeline experts and stakeholders. The investigation determined that the pipeline ruptured due to a faulty weld in a pipeline section constructed in 1956. In addition to specifics about the San Bruno incident, the hearing addressed more general pipeline issues, including public awareness initiatives, pipeline technology, and oversight of pipeline safety by federal and state regulators.[29] The NTSB's findings were highly critical of the pipeline operator (Pacific Gas and Electric, PG&E) as well as both the state and federal pipeline safety regulators. The board concluded that "the multiple and recurring deficiencies in PG&E operational practices indicate a systemic problem" with respect to its pipeline safety program.[30] The board further concluded that

> the pipeline safety regulator within the state of California, failed to detect the inadequacies in PG&E's integrity management program and that the Pipeline and Hazardous Materials Safety Administration integrity management inspection protocols need improvement. Because the Pipeline and Hazardous Materials Safety Administration has not incorporated the use of effective and meaningful metrics as part of its guidance for performance-based management pipeline safety programs, its oversight of state public utility commissions regulating gas transmission and hazardous liquid pipelines could be improved.

In an opening statement about the San Bruno accident report, the NTSB chairman summarized the board's findings as "troubling revelations … about a company that exploited weaknesses in a lax system of oversight and government agencies that placed a blind trust in operators to the detriment of public safety."[31] The NTSB's final accident report concluded "that PHMSA's enforcement program and its monitoring of state oversight programs have been weak and have resulted in the lack of effective Federal oversight and state oversight."[32]

The NTSB issued 39 recommendations stemming from its San Bruno accident investigation, including 20 recommendations to the Secretary of Transportation and PHMSA. These recommendations included the following:

- conducting audits to assess the effectiveness of PHMSA's oversight of performance-based pipeline safety programs and state pipeline safety program certification,
- requiring pipeline operators to provide system-specific information to the emergency response agencies of the communities in which pipelines are located,
- requiring that automatic shutoff valves or remote control valves be installed in high consequence areas and in class 3 and 4 locations,[33]

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notices of proposed rulemaking (ANPRMs), and advisory circulars (ACs).

[29] National Transportation Safety Board (NTSB), "Public Hearing: Natural Gas Pipeline Explosion and Fire, San Bruno, CA, September 9, 2010," web page, March 15, 2011, http://www.ntsb.gov/Events/2011/San_Bruno_CA/default.htm.

[30] NTSB, "Pacific Gas and Electric Company Natural Gas Transmission Pipeline Rupture and Fire, San Bruno, CA, September 9, 2010," NTSB/PAR-11/01, August 30, 2011, p.118.

[31] Deborah A.P. Hersman, Chairman, National Transportation Safety Board, "Opening Statement, Pipeline Accident Report – San Bruno, California, September 9, 2010," August 30, 2011.

[32] NTSB, August 30, 2011, p. 123.

[33] Generally, Class 3 locations have 46 or more buildings intended for human occupancy or lie within 100 yards of

- requiring that all natural gas transmission pipelines constructed before 1970 be subjected to a hydrostatic pressure test that incorporates a spike test,
- requiring that all natural gas transmission pipelines be configured so as to accommodate internal inspection tools, with priority given to older pipelines, and
- revising PHMSA's integrity management protocol to incorporate meaningful metrics, set performance goals for pipeline operators, and require operators to regularly assess the effectiveness of their programs using meaningful metrics.[34]

Marshall, MI, Pipeline Accident Investigation

In July 2012, the NTSB issued the final report of its investigation of the Marshall, MI, oil pipeline spill. In addition to finding management and operation failures by the pipeline operator, the report was critical of PHMSA for inadequate regulatory requirements and oversight of crack defects in pipelines, inadequate regulatory requirements for emergency response plans, generally, and inadequate review and approval of the response plan for this particular pipeline.[35] The NTSB issued eight recommendations to the Secretary of Transportation and PHMSA, including

- auditing the business practices of PHMSA's onshore pipeline facility response plan programs, including reviews of response plans and drill programs, to correct deficiencies,
- allocating sufficient resources to ensure that PHMSA's facility response plan program meets all of the requirements of the Oil Pollution Act of 1990,
- clarifying and strengthening federal regulation related to the identification and repair of pipeline crack defects,
- issuing advisory bulletins to all hazardous liquid and natural gas pipeline operators describing the circumstances of the accident in Marshall, asking them to take appropriate action to eliminate similar deficiencies, to identify deficiencies in facility response plans, and to update these plans as necessary,
- developing requirements for team training of control center staff involved in pipeline operations similar to those used in other transportation modes,
- strengthening operator qualification requirements, and
- harmonizing onshore oil pipeline response planning requirements with those of the U.S. Coast Guard and the U.S. Environmental Protection Agency for oil and petroleum products facilities to ensure that operators have adequate resources for worst-case discharges.[36]

Other Investigations

The NTSB has also made recommendations to PHMSA regarding the definition of a high-consequence area (HCA) in a subsequent West Virginia pipeline accident and has investigated the

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either a building or outside area of public assembly; Class 4 locations are areas where buildings with four or more stories are prevalent. For precise definitions, see 49 C.F.R. 192.5.

[34] NTSB, August 30, 2011, pp. 128-132.

[35] NTSB, "Enbridge Incorporated Hazardous Liquid Pipeline Rupture and Release Marshall, Michigan July 25, 2010," NTSB/PAR-12/01, July 10, 2012, p. xiv.

[36] Ibid., pp. 122-123.

2014 accident in New York City. Detailed discussion of the above accident findings and the NTSB's recommendations are publicly available in the NTSB's docket management system.[37]

In January 2015, the NTSB released a safety study examining integrity management of natural gas transmission pipelines in high consequence areas. The study identified several areas of potential safety improvement among such facilities:

- expanding and improving PHMSA guidance to both operators and inspectors for the development, implementation, and inspection of operators' integrity management programs,
- expanding the use of in-line inspection, especially for intrastate pipelines,
- eliminating the use of direct assessment as the sole integrity assessment method,
- evaluating the effectiveness of the approved risk assessment approaches,
- strengthening aspects of inspector training,
- developing minimum professional qualification criteria for all personnel involved in integrity management programs, and
- improving data collection and reporting, including geospatial data.[38]

Outstanding PHMSA Pipeline Safety Mandates

As stated earlier, the Pipeline Safety Act (P.L. 112-90) imposed 42 mandates on the agency regarding studies, rules, maps, and other elements of the federal pipeline safety program. While PHMSA has fulfilled many of these mandates, by the agency's own accounting, 16 remain incomplete well beyond the deadlines specified in the act, including several key mandates with potentially large impacts on pipeline operations nationwide.[39] The following sections summarize five of the most significant uncompleted mandates, including excerpted statutory language articulating each mandate, its motivation, deadline, and any information provided by PHMSA regarding the mandate's status.

Automatic and Remote-Controlled Shutoff Valves

> **...** the Secretary, if appropriate, shall require by regulation the use of automatic or remote controlled shut-off valves, or equivalent technology, where economically, technically, and operationally feasible on transmission pipeline facilities constructed or entirely replaced after the date on which the Secretary issues the final rule containing such requirement. (§4)

This provision relates to the ability of pipeline operators to quickly stop the uncontrolled flow of a commodity (e.g., crude oil or natural gas) in the event of an accidental pipeline release. Operator delay in shutting down pipeline flow has been an exacerbating factor in a number of recent pipeline accidents, but most prominently in the September 2010 natural gas pipeline release in San Bruno, CA. It took the operator over 90 minutes to stop the flow of natural gas from the pipeline using manual valves. In its subsequent accident report, the NTSB concluded that the damage from the accident could have been reduced if the pipeline operator had installed

[37] Accessible at http://dms.ntsb.gov/pubdms/.

[38] NTSB, *Integrity Management of Gas Transmission Pipelines in High Consequence Areas*, NTSB/SS-15/01, January 27, 2015, Abstract, http://dms.ntsb.gov/public/57000-57499/57122/569749.pdf.

[39] Pipeline and Hazardous Materials Safety Administration, "PHMSA Progress Tracker," online table, May 17, 2016, http://www.phmsa.dot.gov/pipeline/psa/phmsa-progress-tracker-chart.

either automatic shutoff valves (ASVs) or remotely controlled valves (RCVs).[40] While installing or retrofitting ASVs and RCVs is technically possible on most pipeline systems, cost versus safety benefits has been the subject of debate on this issue.

The statutory deadline for this mandate was January 3, 2014. Prior to passage of the Pipeline Safety Act, in October 2010, PHMSA had already issued an Advance Notice of Proposed Rulemaking (ANPRM) for hazardous liquid transmission pipelines requesting public comments on the use of RCVs. The agency issued a separate ANPRM for gas transmission pipelines in October 2011 requesting public comments on installing ASVs and RCVs. PHMSA held a leak detection and valve workshop in March 2012 and also commissioned an independent valve study from Oak Ridge National Laboratory.[41] PHMSA stated in 2015 it was taking public comments and information from the other sources into consideration as it drafted a Notice of Proposed Rulemaking (NPRM) related to ASV and RCV installation and leak detection.[42] PHMSA expects to publish its proposed rule on July 27, 2016, with a public comment period ending 60 days thereafter.[43] The agency has not set a deadline for issuing a final rule.

Leak Detection

> ... if the report required by subsection (a) finds that it is practicable to establish technically, operationally, and economically feasible standards for the capability of leak detection systems to detect leaks, the Secretary shall issue final regulations that—(A) require operators of hazardous liquid pipeline facilities to use leak detection systems where practicable; and (B) establish technically, operationally, and economically feasible standards for the capability of such systems to detect leaks. (§8(b))

This leak detection provision arises from the failure of existing pipeline safety systems to quickly and effectively identify uncontrolled releases in a number of recent pipeline accidents. PHMSA states that it had been exploring issues involving leak detection for a number of years prior to passage of the Pipeline Safety Act.[44] Nonetheless, the NTSB accident report for San Bruno "recommends that PHMSA require that all operators of natural gas transmission and distribution pipelines equip their [control] 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.... "[45]

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[40] National Transportation Safety Board (NTSB), *Pacific Gas and Electric Company Natural Gas Transmission Pipeline Rupture and Fire San Bruno, California September 9, 2010*, NTSB/PAR-11/01, August 30, 2011.

[41] Oak Ridge National Laboratory, *Studies for the Requirements of Automatic and Remotely Controlled Shutoff Valves on Hazardous Liquids and Natural Gas Pipelines with Respect to Public and Environmental Safety*, ORNL/TM-2012/411, October 31, 2012.

[42] Timothy Butters, Acting Administrator, PHMSA, Written Statement before the House Committee on Transportation and Infrastructure Subcommittee on Railroads, Pipelines, and Hazardous Materials hearing on Implementing the Moving Ahead for Progress in the 21st Century Act and the Pipeline Safety, Regulatory Certainty, and Job Creation Act of 2011, April 14, 2015, pp. 12-13.

[43] Department of Transportation, *Report on DOT Significant Rulemakings*, June 2016, p. 93, https://www.transportation.gov/regulations/report-on-significant-rulemakings.

[44] Cynthia L. Quarterman, Administrator, PHMSA, letter to Senator John D. Rockefeller, IV, Chairman, Senate Committee on Commerce, Science, and Transportation, December 27, 2012, p. 1,

http://www.phmsa.dot.gov/pv_obj_cache/pv_obj_id_F63D328798E54C2A672D84BD398F12EA45E00A00/filename/Rep%20%20to%20Congress%20on%20Leak%20Detection%20-%20Dec%202012.pdf.

[45] NTSB, August 30, 2011, p. 102.

The statutory deadline for this mandate was as soon as practicable after January 3, 2014. The agency has linked its leak detection rulemaking to its valve rulemaking under section 4 of the Pipeline Safety Act. As stated above, PHMSA held a leak detection and valve workshop in March 2012. In December 2012, PHMSA submitted to Congress a mandated report on leak detection systems and gaps in associated industry standards used by hazardous liquid operators.[46] The acting administrator testified that PHMSA is taking a two-pronged approach to leak detection: (1) the current rulemaking aimed at improving existing requirements based on currently available technology, and (2) funding a research and development project to improve leak detection system design redundancy and accuracy for the future.[47] The agency's October 2015 NPRM addressed this mandate. PHMSA plans to issue a final rule in the coming months.[48]

Accident and Incident Notification

> ... the Secretary of Transportation shall revise regulations ... to establish specific time limits for telephonic or electronic notice of accidents and incidents involving pipeline facilities to the Secretary and the National Response Center.... In revising the regulations, the Secretary, at a minimum, shall—
>
> (1) establish time limits for telephonic or electronic notification of an accident or incident to require such notification at the earliest practicable moment following confirmed discovery of an accident or incident and not later than 1 hour following the time of such confirmed discovery;
>
> (2) review procedures for owners and operators of pipeline facilities and the National Response Center to provide thorough and coordinated notification to all relevant State and local emergency response officials, including 911 emergency call centers, for the jurisdictions in which those pipeline facilities are located in the event of an accident or incident, and revise such procedures as appropriate; and
>
> (3) require such owners and operators to revise their initial telephonic or electronic notice to the Secretary and the National Response Center with an estimate of the amount of the product released, an estimate of the number of fatalities and injuries, if any, and any other information determined appropriate by the Secretary within 48 hours of the accident or incident, to the extent practicable. (§9)

Timely notification of emergency responders is widely understood to be a key factor in minimizing the impacts of an accidental pipeline release. Current regulations require pipeline operators to notify the National Response Center of a pipeline incident "at the earliest practicable moment following discovery."[49] For decades prior to passage of the Pipeline Safety Act, this regulatory provision has been interpreted by PHMSA and operators to imply reporting within one to two hours of an incident.[50] With regard to local responders, in its initial investigation of the San

[46] PHMSA, *Final Report: Leak Detection Study – DTPH56-11-D-000001*, December 10, 2012, http://www.phmsa.dot.gov/staticfiles/PHMSA/DownloadableFiles/Files/Press%20Release%20Files/Leak%20Detection%20Study.pdf.

[47] Timothy Butters, April 14, 2015, p. 15.

[48] Marie Therese Dominguez, Administrator, PHMSA, written testimony before the House Committee on Energy and Commerce, Subcommittee on Energy and Power hearing on Examining Pipeline Safety Reauthorization, March 1, 2016, p. 4, http://www.phmsa.dot.gov/pv_obj_cache/pv_obj_id_2CB7A7D1615783286C47D83C1A933FF627E80100/filename/Written_Testimony_Marie_Therese_Dominguez_Administrator_of_PHMSA_3_1_2016.pdf.

[49] 49 C.F.R. 191.5

[50] See, for example: US Department of Transportation, Research and Special Programs Administration, Pipeline Safety Alert Notice, ALN-91-01, April 15, 1991.

Bruno pipeline accident, the NTSB concluded that "emergency responders in communities around the country may not have the information that they need in order to most effectively react to a pipeline leak or rupture."[51] Therefore, timely communication between the National Response Center and local responders is also important.

Congress required these regulatory changes to be implemented by July 3, 2013. In 2013, PHMSA issued an advisory bulletin reaffirming that operators "should" make a telephonic report of a pipeline incident to the National Response Center within two hours of discovering the incident.[52] The agency's website currently states that it "expects" such two-hour notification.[53] PHMSA has also issued advisory bulletins about communication during emergency situations (in 2012) and emergency preparedness communications (in 2010), both of which apply to local emergency response, including 911 call centers. PHMSA published an advanced notice of a proposed rulemaking (ANPRM) with a one-hour reporting requirement on July 10, 2015, but a final rule has not been issued.[54] The PHMSA Administrator testified in March 2016 that the agency was considering public comments and planning to present a proposed rule to its advisory committee "this spring," but PHMSA has not set a date for issuing the final rule.[55]

Excess Flow Valves

> ... the Secretary, if appropriate, shall by regulation require the use of excess flow valves, or equivalent technology, where economically, technically, and operationally feasible on new or entirely replaced distribution branch services, multifamily facilities, and small commercial facilities. (§22)

In natural gas distribution systems, which connect directly to gas consumers, "excess flow" valves are safety devices which can automatically shut off pipeline flow in the event of a leak, thereby reducing the likelihood or severity of a fire or explosion. They serve a similar function to automatic shutoff valves in larger natural gas transmission pipelines. PHMSA issued new standards requiring the installation of excess flow valves on new gas distribution lines in single-family homes as part of its final rule for natural gas distribution integrity management programs on December 3, 2009.[56] The Pipeline Safety Act would extend this requirement "if appropriate," to new distribution lines as well as service lines to multi-family residential buildings and small businesses. Although smaller in scale, automatic valves in distribution lines raise cost and safety tradeoffs similar to those for automatic valves in large diameter pipelines.

The statutory mandate for this provision was January 3, 2014. In 2011, PHMSA issued an ANPRM titled "Expanding the Use of Excess Flow Valves in Gas Distribution Systems to

[51] National Transportation Safety Board (NTSB), "NTSB Issues Three Safety Recommendations after It Finds Deficiencies in Emergency Notification Requirements of Pipeline Operators," press release, June 8, 2011.

[52] PHMSA, "Pipeline Safety: Accident and Incident Notification Time Limit," 78 *Federal Register* 6402, January 30, 2013.

[53] PHMSA, "Incident Reporting," web page, March 24, 2016, http://www.phmsa.dot.gov/incident-report.

[54] PHMSA, "Pipeline Safety: Operator Qualification, Cost Recovery, Accident and Incident Notification, and Other Pipeline Safety Proposed Changes; Proposed Rule," 80 *Federal Register* 39915, July 10, 2015.

[55] Marie Therese Dominguez, March 1, 2016, p. 5.

[56] U.S. Department of Transportation, "DOT Issues Much-Anticipated Rules to Enhance Pipeline Safety," Office of Public Affairs, press release, December 3, 2009.

Applications Other Than Single-Family Residences."[57] PHMSA published a NPRM on July 8, 2015.[58] The agency expects to publish its final rule in January 2017.[59]

Maximum Allowable Operating Pressure Verification

> (b) REPORTING.—(1) DOCUMENTATION OF CERTAIN PIPELINES.—Not later than 18 months after the date of enactment of this section, each owner or operator of a pipeline facility shall identify and submit to the Secretary documentation relating to each pipeline segment of the owner or operator described in subsection (a)(1) for which the records of the owner or operator are insufficient to confirm the established maximum allowable operating pressure of the segment....
>
> In the case of a transmission line of an owner or operator of a pipeline facility identified under subsection (b)(1), the Secretary shall—(A) require the owner or operator to reconfirm a maximum allowable operating pressure as expeditiously as economically feasible; and (B) determine what actions are appropriate for the pipeline owner or operator to take to maintain safety until a maximum allowable operating pressure is confirmed. (§23)

Inadequate records for older natural gas transmission pipelines have been a long-standing concern among pipeline safety advocates. In its San Bruno investigation, the NTSB found that the pipeline operator's records for the ruptured pipeline—originally constructed in the 1940s—were inaccurate and incomplete, failing to document its original maximum allowable operating pressure (MAOP) and using flawed methods to determine MAOP in later years.[60] In 2011, as a response to its initial investigation of the San Bruno accident, the NTSB issued urgent new safety recommendations "to address record-keeping problems that could create conditions in which a pipeline is operated at a higher pressure than the pipe was built to withstand."[61] The NTSB has also recommended that all natural gas transmission pipelines be configured to accommodate internal inspection tools ("smart pigs") and that pipelines constructed before 1970 be subjected to hydrostatic pressure tests (filling a pipeline with water under pressure) to verify MAOP. However, experts note that there are different pipeline inspection techniques with overlapping capabilities and different strengths which should be considered in a portfolio of maintenance practices.

The statutory mandate for this provision was July 3, 2013. PHMSA's acting administrator testified in May 2015 that the agency had taken steps involving pipeline operator verification of records, reporting, determination of MAOP, and testing regulations. PHMSA now requires all operators to report pipelines without sufficient MAOP records. According to the agency, this information collection has provided an inventory of pipelines without sufficient records and has helped define the potential impact of any potential new regulations.[62] In 2012 PHMSA also issued advisory bulletins reminding pipeline operators (gas and liquid) to verify their MAOP records

[57] PHMSA, "Pipeline Safety: Expanding the Use of Excess Flow Valves in Gas Distribution Systems to Applications Other Than Single-Family Residences," 76 *Federal Register* 72666, November 25, 2011.

[58] PHMSA, "Pipeline Safety: Expanding the Use of Excess Flow Valves in Gas Distribution Systems to Applications Other Than Single-Family Residences," 80 *Federal Register* 41460, July 15, 2015.

[59] Department of Transportation, *Report on DOT Significant Rulemakings*, June 2016, p. 90, https://www.transportation.gov/regulations/report-on-significant-rulemakings.

[60] NTSB, August 30, 2011, p. 106.

[61] National Transportation Safety Board, "NTSB Issues Urgent Safety Recommendations as a Result of Preliminary Findings in San Bruno Pipeline Rupture Investigation; Hearing Scheduled For March," SB-11-01, press release, January 3, 2011.

[62] Timothy Butters, April 14, 2015, p. 18.

under existing regulations[63] and requiring gas pipeline operators to report when they exceed MAOP.[64] PHMSA has engaged stakeholders in developing a fitness for service concept for pipelines (the "Integrity Verification Process"), including a 2013 public workshop, and has solicited public comments prior to commencing rulemaking.[65] A proposed rule was submitted to the President's Office of Management and Budget for review on April 27, 2015.[66] PHMSA issued an NPRM addressing this mandate on March 17, 2016.[67] The agency has not set a deadline for issuance of its final rule.

Key Policy Issues

In addition to the outstanding mandates of the Pipeline Safety Act, other, long-standing concerns, such as PHMSA inspector staffing, underground natural gas storage safety, and the safety of unregulated pipelines, continue to evolve and receive attention from stakeholders. In the context of its continuing oversight of federal pipeline safety, and in light of findings from recent pipeline accidents, the 114th Congress may focus on certain key issues as it considers PHMSA's reauthorization.

Staffing Resources for Pipeline Safety

The U.S. pipeline safety program employs a combination of federal and state staff to implement and enforce federal pipeline safety regulations. To date, PHMSA has relied heavily on state agencies for pipeline inspections, with nearly three-fourths of inspectors being state employees. Some in Congress have criticized inspector staffing at PHMSA as being insufficient to adequately cover pipelines under the agency's jurisdiction, notwithstanding state agency cooperation. In considering PHMSA staff levels, three distinct issues are the overall number of federal inspectors, the agency's historical use of staff funding, and the staffing of pipeline safety inspectors among the states.

PHMSA Inspection and Enforcement Staff

In FY2016, PHMSA is funded for 302 full-time equivalent (FTE) employees. As noted earlier, PHMSA actually employed 266 pipeline safety staff as of May 2, 2016, based on the agency's organizational chart, which lists every staff position.[68] According to PHMSA officials, the agency continues hiring and anticipates employing additional staff in the second half of the fiscal year.[69] S. 2276 authorizes approximately $150 million in FY2017, rising to approximately $157 million in FY2019.

If PHMSA were to be funded at the level of the P.L. 114-183 authorization, funded FTEs in FY2017 would likely be similar to those funded in FY2016. If all funded PHMSA staff positions

[63] PHMSA, "Pipeline Safety: Verification of Records," 77 *Federal Register* 26822, May 7, 2012.

[64] PHMSA, "Pipeline Safety: Reporting of Exceedances of Maximum Allowable Operating Pressure," 77 *Federal Register* 75699, December 21, 2012.

[65] Timothy Butters, April 14, 2015, p. 18.

[66] PHMSA, June 23, 2015, p. 7.

[67] PHMSA, "PHMSA Proposes New Safety Regulations for Natural Gas Transmission Pipelines," press release, PHMSA 02-16, March 17, 2016.

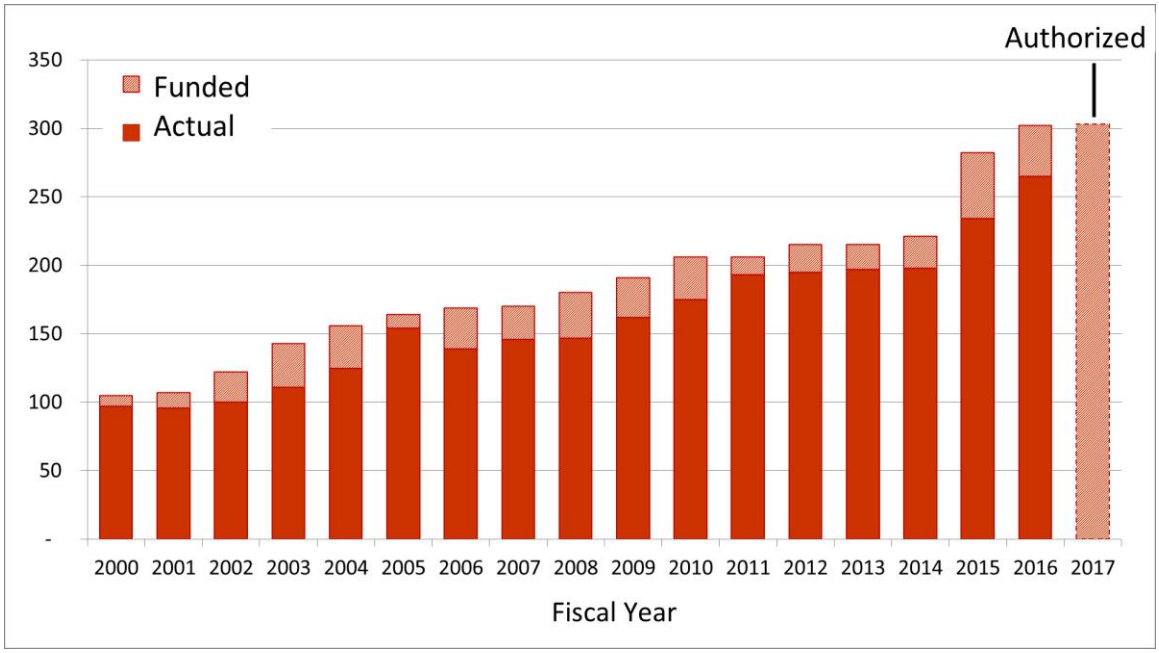
[68] Pipeline and Hazardous Materials Safety Administration, "PHMSA Pipeline Safety Program," organizational chart, May 2, 2016, http://phmsa.dot.gov/pv_obj_cache/pv_obj_id_79950CC44CFF00142BB2ABBBE5039F4406980300/filename/ops_orgchart.pdf.

[69] Artealia Gilliard, PHMSA, personal communication, May 20, 2016.

were filled, the hiring of over 30 additional FTEs above the actual staffing as of May 2016 would amount to a significant increase in PHMSA staff growth (of mostly inspectors). These staff additions would continue an expansion begun over 10 years ago in response to a series of industry developments, most notably a 1999 Bellingham, WA, fatal accident, the terrorist attacks of 9/11, implementation of PHMSA's integrity management regulations, and the boom in U.S. shale gas and oil production (**Figure 4**).

Figure 4. PHMSA Pipeline Safety Staffing, Historical and Proposed

(Full-Time Equivalent Staff)



Sources: U.S. Office of Management and Budget, *Budget of the United States Government: Appendix*, Fiscal Years1996-2017; Pipeline and Hazardous Materials Safety Administration, "PHMSA Pipeline Safety Program," organizational chart, May 2, 2016.

Notes: Funded staff are "estimated staff" anticipated by the agency as reported in annual budget requests. They differ from actual staff employed (for the same fiscal year) as reported in subsequent budget requests. Actual staff for 2016 are from PHMSA's organizational chart. FY2017 figure is estimated by CRS.

One issue that has complicated the debate about PHMSA staffing is a long-term pattern of understaffing in the agency's pipeline safety program. At least as far back as 1994, PHMSA's (or its predecessor's) actual staffing for pipeline safety as reported in annual budget requests has generally fallen well short of the level of staffing anticipated in the prior year's budget request. For example, the President's FY2011 budget request for pipeline safety reports 175 actual employees in 2009. However, the FY2010 budget request reported funding for 191 employees ("estimated") for 2009. On this basis, from 2000 through 2016, budget requests indicate a staffing shortfall averaging approximately 25 employees every year (**Figure 4**) with the greatest shortfall, 48 employees, in 2015. Most of this staffing shortage has been among inspectors.

PHMSA officials have offered a number of reasons for the persistent shortfall in inspector staffing. These reasons include a scarcity of qualified inspector job applicants, delays in the federal hiring process during which applicants accept other job offers, and PHMSA inspector turnover—especially to pipeline companies which often hire away PHMSA inspectors for their corporate safety programs. Because PHMSA pipeline inspectors are extensively trained by the agency (typically for two years before being allowed to operate independently), they are highly

valued by pipeline operators seeking to comply with federal safety regulations. The agency has stated that it is challenged by industry recruitment of the same candidates it is recruiting, especially with the rapid development of unconventional oil and gas shales, for which the skill sets PHMSA seeks (primarily engineers) have been in high demand.[70]

To overcome its pipeline inspector hiring challenges, PHMSA states that it has a "robust recruitment and outreach strategy" that includes certain non-competitive hiring authorities (e.g., Veterans Employment Opportunities Act) and the Pathways and Presidential Management Fellows programs. The agency offers recruitment, relocation and retention incentives, and is expanding its use of the student loan repayment program. In addition to posting vacancy announcements on USAJOBS, PHMSA posts job announcements using social media (Twitter and LinkedIn), conducts outreach to professional organizations and veterans groups, and attends career fairs and on-campus hiring events. PHMSA also plans to explore partnerships with engineering schools to help the agency recruit for inspector and enforcement positions.[71]

P.L. 112-90 required the DOT to report to Congress on PHMSA's total FTEs for pipeline inspection and enforcement, the number of positions not presently filled, the reasons they are not filled, actions being taken to fill the FTEs, and any additional resources needed (§31(a)). On November 30, 2012, PHMSA reported to Congress only that it had filled all of the funded vacancies for pipeline inspectors and enforcement as of September 30, 2012.[72] (Presumably, the vacant FTEs reported for FY2012 in **Figure 3** represent other staff.) This full employment of funded inspection staff was only temporary, however, as indicated by subsequent staffing shortfalls.

Whether funding for pipeline safety staff under P.L. 114-183 would yield the optimal number of pipeline safety inspectors remains to be seen. However, filling new positions, in addition to filling all previously authorized positions, and retaining employees, may continue to pose practical challenges for the agency. Accordingly, P.L. 114-183 includes a mandatory review of PHMSA's staff resource management, including:

> (1) geographic allocation plans, hiring and time-to-hire challenges, and expected retirement rates and recruitment and retention strategies;
>
> (2) an identification and description of any previous periods of macroeconomic and pipeline industry conditions under which the Pipeline and Hazardous Materials Safety Administration has encountered difficulty in filling vacancies, and the degree to which special hiring authorities, including direct hiring authority authorized by the Office of Personnel Management, could have ameliorated such difficulty; and
>
> (3) recommendations to address hiring challenges, training needs, and any other identified staff resource challenges (§9(a)).

The study is to be completed within one year of enactment by the Inspector General of the Department of Transportation.

[70] Linda Daugherty, Pipeline and Hazardous Materials Safety Administration, personal communication, December 13, 2012.

[71] Artealia Gilliard, PHMSA, personal communication, July 31, 2015.

[72] Cynthia L. Quarterman, Administrator, PHMSA, Letter to The Honorable John L. Mica, Chairman, Committee on Transportation and Infrastructure, November 30, 2012.

Direct-Hire Authority

One specific remedy PHMSA has pursued in its efforts to recruit pipeline inspectors is to seek direct-hire authority (DHA) from the Office of Personnel Management (OPM). This authority can expedite hiring, for example, by eliminating competitive rating and ranking, or not requiring veterans' preference. OPM can grant DHA to federal agencies in cases of critical hiring need or a severe shortage of candidates.[73]

In its 2013 appropriations report, the House Appropriations Committee stated

> The Committee is aware of several challenges PHMSA faces in hiring pipeline safety inspectors. One such challenge is the delay caused by the federal hiring process, which is compounded by other market dynamics. The Committee encourages the Office of Personnel Management to give strong consideration to PHMSA's request for direct-hire authority for its pipeline safety inspection and enforcement personnel. Such authority may enable PHMSA to increase its personnel to authorized levels and thereby demonstrate the need for additional resources.[74]

The same language appears in the committee's 2014 appropriations report. Consistent with the committee's recommendations, PHMSA applied to the OPM for direct-hire authority in April 2015 but was denied. According to PHMSA, the OPM informed agency officials of the denial verbally, but did not provide a formal, written explanation for the denial at the time.[75] In 2016, the PHMSA administrator reiterated the agency's desire for DHA, stating that it "would complement our recruitment efforts by reducing the agency's time to hire from more than 100 days to less than 30 days."[76] P.L. 114-183 does not grant PHMSA direct-hire authority, but would allow the agency to apply to the OPM for it upon identification of a period of macroeconomic and pipeline industry conditions creating difficulty in filling pipeline safety job vacancies (§9b). Given the overall employment challenges facing PHMSA, such direct-hire authority could help alleviate understaffing, but may not resolve it.

State Pipeline Inspector Funding

Because state agencies would continue to account for the majority of U.S. pipeline safety inspectors, even under the President's FY2017 budget request, an important consideration is how the number of state inspectors has been affected by budget constraints faced by many states during the ongoing recovery from the recent U.S. economic recession. Under P.L. 109-468 (§2(c)), PHMSA is authorized to award grants reimbursing state governments for up to 80% of the cost of the staff, personnel, and activities required to support the federal pipeline safety program. According to DOT, these grants have been essential to "enable the states to continue their current programs and hire additional inspectors ... [and] assure that states do not turn over responsibility for distribution pipeline systems to the Federal inspectors," among other reasons.[77]

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[73] Office of Personnel Management, "Hiring Authorities: Direct Hire Authority," online fact sheet, September 14, 2015, https://www.opm.gov/policy-data-oversight/hiring-authorities/direct-hire-authority/#url=Fact-Sheet.

[74] U.S. Congress, House Committee on Appropriations, *Departments of Transportation, and Housing and Urban Development, and Related Agencies Appropriations Bill, 2013*, committee print, 112th Cong., 2nd sess., June 20, 2012, H.R. 541 (Washington: GPO, 2013), p. 66.

[75] Artealia Gilliard, July 31, 2015.

[76] Marie Therese Dominguez, PHMSA Administrator, statement before the House Committee on Transportation and Infrastructure Hearing on Pipeline Reauthorization, February 25, 2016.

[77] U.S. Department of Transportation, *Pipeline And Hazardous Materials Safety Administration, FY 2011 Budget Request*, February 1, 2010, p. 31, http://www.dot.gov/budget/2011/budgetestimates/phmsa.pdf.

Notwithstanding federal pipeline safety grants, inspector staffing at state pipeline safety agencies is not assured. During the recent recession, state inspectors were negatively affected by state budget deficits, for example, by being temporarily furloughed without pay.[78] PHMSA officials in the past have also reportedly cited unfilled positions among state pipeline safety agencies as a risk to state pipeline safety programs.[79] The possibility that some states may have staffing limitations affecting their roles as agents for the federal pipeline safety program may warrant continued attention from Congress.

Underground Natural Gas Storage Safety

Between October 23, 2015, and February 11, 2016, the Aliso Canyon Underground Storage Facility near the Porter Ranch community in Los Angeles County, CA, experienced a massive natural gas leak. The Aliso Canyon facility is a depleted oil field that was converted to a natural gas storage reservoir in the 1970s. It is owned and operated by Southern California Gas Company, an investor-owned utility in California regulated by the California Public Utilities Commission (CPUC). The leak was reportedly caused by damage to a well casing approximately 500 feet underground.[80] The incident released an estimated 5.4 billion cubic feet of natural gas into the atmosphere—equivalent to 94,000 metric tons of methane, a potent greenhouse gas.[81] The risk to safety from the fugitive methane and the presence of odorants and other chemicals in the gas led to the temporary relocation of over 2,000 households and two schools.[82] Both the occurrence of the leak, and the length of time it took to stop it, raised serious concerns in Congress about the risks of such facilities and about regulations to insure their safe operation.[83]

The Aliso Canyon facility is permitted and regulated by the CPUC; principal safety oversight and accident response authorities rest with state and local agencies. The federal government's response to the leak was therefore limited primarily to technical assistance through a variety of entities, including PHMSA. As discussed earlier, the Natural Gas Pipeline Safety Act of 1968 authorizes PHMSA to promulgate minimum safety standards for natural gas pipeline facilities. However, court decisions from two different federal circuits (7th and 10th) are split on whether underground storage reservoirs are classified as "facilities."[84] Currently, PHMSA defers to state agencies, such as the CPUC, to regulate the safety of underground natural gas storage sites within their borders. Furthermore, the agency has worked with industry to develop voluntary recommended practices for ensuring the safety of sites in depleted hydrocarbon reservoirs and

[78] National Association of Pipeline Safety Representatives, RE: Request for Waiver of Prior Three Year Average State Expense Component of the Pipeline Safety Grant Program, letter to Mr. Jeffrey D. Weise, Associate Administrator for Pipeline Safety, Pipeline And Hazardous Materials Safety Administration, October 15, 2010, http://www.wutc.wa.gov/webimage.nsf/web+objects/CCOPS_DOCs_by_Year/$file/NAPSR%20letter%20to%20PHMSA%20dated%2010-15-09-Waiver%20Request.pdf.

[79] Stephanie Seay, "Budget Woes May Impede Local Pipe Safety Efforts," *Gas Daily*, November 8, 2010.

[80] California Department of Conservation, "Information about the Aliso Canyon Natural Gas Leak," fact sheet, December 11, 2015.

[81] California Air Resources Board, "Aliso Canyon Natural Gas Leak: Preliminary Estimate of Greenhouse Gas Emissions," February 13, 2016.

[82] For more discussion of the incident's emissions and their impacts, see. CRS Insight IN10448, *The Aliso Canyon Natural Gas Leak: Public Health and Environmental Impacts*, by Richard K. Lattanzio.

[83] See, for example: Office of Representative Brad Sherman, "Congressman Sherman Calls For Immediate Cross-Agency Solution to Porter Ranch Gas Leak," press release, January 5, 2016.

[84] United States District Court, S.D. Illinois, 410 F. Supp.2d 715 (S.D. Ill. 2006), Petco Petroleum v. Natural Gas Pipeline Company; United States District Court, D. Kansas, 707 F. Supp.2d 1169 (D. Kan. 2010), Colorado Interstate Gas Company v. Wright.

salt cavern reservoirs. Shortly after the Aliso Canyon incident, PHMSA issued a bulletin advising (but not requiring) all storage site operators to follow these recommended practices.[85]

New PHMSA Safety Measures

As a result of the Aliso Canyon leak, California has adopted safety regulations for all underground natural gas storage facilities in the state under an emergency rulemaking process.[86] President Obama also reportedly committed to direct PHMSA to promulgate safety standards under the agency's existing statutory authority.[87] On April 1, 2016, the Department of Energy and PHMSA jointly announced a new Interagency Task Force on Natural Gas Storage Safety. According to the announcement PHMSA will "initiate regulatory actions to help ensure the safety of natural gas storage facilities across the country, which may include requiring operators to follow some or all of the industry consensus standards recommended by PHMSA's recent safety bulletin."[88] PHMSA also is currently considering adopting the voluntary provisions of the recommended practices "in a manner that would make them mandatory, except that operators would be permitted to deviate from the [recommended practices] if they provide justification."[89] PHMSA expects to publish an Interim Final Rule by November 25, 2016.[90] Notwithstanding the above actions by the Obama Administration, P.L. 114-183 requires PHMSA to promulgate minimum federal safety standards for underground natural gas storage facilities nationwide within two years of enactment (§16). The act would also mandate the formation of a federal inter-agency task force to assess and report on (1) the cause of and response to the Aliso Canyon leak and (2) federal efforts to ensure the safety of underground gas storage facilities (§31).

EPA's Methane Regulations

The Emergency Powers provisions of Section 303 of the Clean Air Act, codified at 42 U.S.C. 7603, authorizes the Environmental Protection Agency (EPA) to bring suit, issue orders, or take other action as necessary—in consultation with appropriate state and local authorities—"upon receipt of evidence that a pollution source ... is presenting an imminent and substantial endangerment to public health or welfare, or the environment." Additional enforcement authorities to respond to an actual or threatened accidental release of a regulated substance from a stationary source are provided under Section 112(r)(9) of the Clean Air Act, codified at 42 U.S.C. 7412. Herein, methane is designated as a regulated flammable substance. The EPA Administrator reportedly has stated an intent for the agency to "do more" to curb methane emissions from existing sources in the oil and gas industry.[91] On May 12, 2016, the EPA issued a final rule setting

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[85] PHMSA, *Pipeline Safety: Safe Operations of Underground Storage Facilities for Natural Gas,* Advisory Bulletin, Docket No. PHMSA-2016-0016, February 2, 2016.

[86] California Department of Conservation, *Requirements for Underground Gas Storage Projects,* January 15, 2015, http://www.conservation.ca.gov/index/Documents/DOC%202016-0126-03E%20Gas%20Storage%20Requirements%20-%20Revised%20Notice%20and%20Finding%20of%20Emergency.pdf

[87] Sarah. D. Wire, "President Obama Pledges National Gas Storage Safety Standards," *Los Angeles Times,* February 19, 2016.

[88] U.S. Department of Energy, "Working Together to Address Natural Gas Storage Safety," press release, April 1, 2016, http://energy.gov/articles/working-together-address-natural-gas-storage-safety.

[89] Department of Transportation, *Report on DOT Significant Rulemakings,* June 2016, p. 96, https://www.transportation.gov/regulations/report-on-significant-rulemakings.

[90] Ibid.

[91] Ernest Scheyder, "U.S. Energy Industry Emits More Methane than Thought: EPA Chief," *Reuters,* February 24, 2016.

new source performance standards for the sector in the summer.[92] However, the rules do not cover the Aliso Canyon facility, because, among other reasons, (1) the standards apply to new and modified sources of emissions, not existing ones, and (2) the standards do not list underground storage facilities as a covered source category.

As Congress continues its oversight of underground natural gas storage safety, it may examine any regulatory schemes for storage that emerge either from new legislation or under existing statutory authorities. As part of this oversight, Congress may focus on the relationship between PHMSA, the EPA, and state agencies which may play cooperative roles in implementing a new federal program to ensure underground natural gas storage safety.

State Pipeline Safety Program Oversight

Apart from their levels of inspector staffing, state pipeline safety programs have come under recent scrutiny regarding their overall effectiveness. In the wake of the San Bruno pipeline accident, the California state pipeline safety program—which had regulatory responsibility for the pipeline that ruptured—was criticized by the NTSB for its failure to detect the pipeline's problems. The NTSB was also critical of PHMSA's oversight because the agency had not "incorporated the use of effective and meaningful metrics as part of its guidance for performance-based management" of state pipeline safety programs.[93] A 2014 investigation by the DOT Office of Inspector General (IG) assessed the effectiveness of PHMSA's state program oversight as recommended by the NTSB. The IG report stated

> PHMSA's oversight of State pipeline safety programs is not sufficient to ensure States comply with program evaluation requirements and properly use suspension grant funds. Lapses in oversight have resulted in undisclosed safety weaknesses in State programs.[94]

The IG report recommended that PHMSA "take actions to further refine its policies and procedures for managing the program, including its guidelines to the States and improve its oversight to ensure States fulfill their role in pipeline safety."[95] The report made seven specific programmatic recommendations to achieve these goals. In its response to a draft version of the IG report, PHMSA officials concurred or partially concurred with all of the IG reports' recommendations, describing actions it had taken to address the IG's concerns.[96] The IG report therefore considered all but two of its recommendations resolved, but urged PHMSA to reconsider and clarify its response to the remaining two recommendations. These recommendations pertained to PHMSA's staffing formula and its annual evaluations of inspection procedures among the states.[97] How PHMSA has implemented changes to its evaluation of state agents and the performance of those state pipeline safety agencies may be an oversight issue for Congress.

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[92] U.S. Environmental Protection Agency, "Oil and Natural Gas Sector: Emission Standards for New, Reconstructed, and Modified Sources," May 12, 2016, https://www3.epa.gov/airquality/oilandgas/may2016/nsps-finalrule.pdf.

[93] NTSB, August 30, 2011, p. xi.

[94] Department of Transportation, Office of Inspector General, *PHMSA'S State Pipeline Safety Program Lacks Effective Management and Oversight*, AV-2104-041, May 7, 2014, p. 2. Suspension grants are awarded by PHMSA to fiscally challenged states to help them maintain or expand their pipeline safety programs.

[95] Ibid., p. 10.

[96] Ibid., pp. 18-25.

[97] Ibid., p. 14.

PHMSA Penalties and Pipeline Safety Enforcement

The adequacy of PHMSA's enforcement strategy has been an ongoing focus of congressional interest.[98] Provisions in P.L. 107-355 put added scrutiny on the effectiveness of the agency's enforcement strategy and assessment of civil penalties (§8). In April 2006, PHMSA officials testified before Congress that the agency had institutionalized a "tough-but-fair" approach to enforcement, "imposing and collecting larger penalties, while guiding pipeline operators to enhance higher performance."[99] According to the agency, $4.6 million in proposed civil penalties in 2005 was three times greater than penalties proposed in 2003, the first year higher penalties could be imposed under P.L. 107-355 (§8(a)).[100] P.L. 112-90 increased the maximum civil penalty from $1.0 million to $2.0 million for a related series of major consequence violations, such as those causing serious injuries, deaths, or environmental harm (§2(a)).

Although PHMSA's imposition of pipeline safety penalties increased quickly after P.L. 107-355 was enacted, and despite the higher penalty ceiling under P.L. 112-90, the role of federal penalties in promoting greater operator compliance with pipeline safety regulations is not always clear. To understand the potential influence of penalties on operators, it can be helpful to put PHMSA fines in the context of the overall costs to operators of a pipeline release.

Pipeline companies, seeking to generate financial returns for their owners, are motivated to operate their pipelines safely (and securely) for a range of financial reasons. While these financial considerations certainly include possible PHMSA penalties, the costs of a pipeline accident may also include fines for violations of environmental laws (federal and state), the costs of spill response and remediation, penalties from civil litigation, the value of lost product, costs for pipeline repairs and modifications (e.g., to resolve federal regulatory interventions), and other costs. Depending upon the severity of a pipeline release, these other costs may far exceed pipeline safety fines, as illustrated by the following examples. Therefore, it is not clear how large an effect increasing PHMSA's authorized fines, alone, might have on operator compliance.

- **Kinder Morgan.** In April 2006 Kinder Morgan Energy Partners entered into a consent agreement with PHMSA to resolve a corrective action order stemming from three hazardous liquid spills in 2004 and 2005 from the company's Pacific Operations pipeline unit.[101] According to the company, the agreement would require Kinder Morgan to spend approximately $26 million on additional integrity management activities, among other requirements.[102] Under a 2007 settlement agreement with the U.S. Justice Department and the State of California, Kinder Morgan also agreed to pay approximately $3.8 million in civil penalties for violations of environmental laws and approximately $1.5 million related to response and remediation associated with these spills. The spills collectively released approximately 200,000 gallons of diesel fuel, jet fuel, and

[98] See, for example: Representative James L. Oberstar, Statement before the House Committee on Transportation and Infrastructure, Hearing on the Enbridge Pipeline Oil Spill in Marshall, MI, September 15, 2010.

[99] S.L. Gerard, Pipeline and Hazardous Materials Administration, testimony before the House Energy and Commerce Committee, Energy and Air Quality Subcommittee hearing on Pipeline Safety, Serial No. 109-84, April 27, 2006, p. 14.

[100] Ibid. These figures only reflect administrative enforcement cases. They exclude cases that PHMSA has referred to the Department of Justice for civil and criminal enforcement under 49 C.F.R. 190.231 and 190.235.

[101] Pipeline and Hazardous Materials Safety Administration, *Consent Agreement: In the Matter of Kinder Morgan Energy Partners, L.P., Respondent*, CPF No. 5-2005-5025H, April 4, 2006.

[102] Kinder Morgan Energy Partners, L.P., "Kinder Morgan Energy Partners Enters into Consent Agreement with PHMSA," press release, Houston, TX, April 10, 2006.

gasoline.[103] This volume of fuel would have a product value on the order of $0.5 million based on typical wholesale market prices at the time of the spills.

- **Plains All American.** In 2010, Plains All American Pipeline agreed to spend approximately $41 million to upgrade 10,420 miles of U.S. oil pipeline to resolve Clean Water Act (CWA) violations for 10 crude oil spills in Texas, Louisiana, Oklahoma, and Kansas from 2004 through 2007. Among these upgrades, the company agreed to spend at least $6 million on equipment and materials for internal corrosion control and surveys on at least 2,400 miles of pipeline. The company was required to pay a $3.25 million civil penalty associated with the CWA violations.[104]
- **Enbridge.** Enbridge Energy Partners estimated expenses exceeding $1.2 billion to clean up oil spilled on its Lakehead pipeline system in 2010 in Marshall, MI.[105] The pipeline operator also reported $16 million in lost revenue from pipeline shipments it could not redirect to other lines while the Lakehead system was out of service.[106] The full impact of these expenditures on the company's business is unclear, however. Enbridge stated in a quarterly report that "a majority of the costs" related to its oil spill in Marshall were covered by insurance, but that the company had exceeded the aggregate limit of $650 million for pollution liability under its insurance policy.[107]
- **Olympic Pipe Line.** After the 1999 Bellingham, WA, pipeline accident, Olympic Pipe Line Company and associated defendants reportedly agreed to pay a $75 million settlement to the families of two children killed in the accident.[108]
- **El Paso.** In 2002, El Paso Corporation settled wrongful death and personal injury lawsuits stemming from the 2000 natural gas pipeline explosion near Carlsbad, NM, which killed 12 campers.[109] Although the terms of those settlements were not disclosed, two additional lawsuits sought a total of $171 million in damages.[110] However, El Paso's June 2003 quarterly financial report stated that "our costs and legal exposure ... will be fully covered by insurance."[111]
- **Pacific Gas and Electric Company (PG&E).** On April 9, 2015, the California Public Utility Commission imposed on PG&E a fine, along with other penalties and remedies, totaling $1.6 billion stemming from the San Bruno pipeline

[103] U.S. Environmental Protection Agency, "Kinder Morgan, SFPP Agree to Pay Nearly $5.3 Million to Resolve Federal And State Environmental Violations," press release, May 21, 2007.

[104] U.S. Environmental Protection Agency, "Plains Pipeline to Spend $41 Million to Prevent Oil Spills Across 10,000 Miles of Pipeline," press release, August 10, 2010.

[105] Enbridge Energy Partners, L.P., Quarterly Report Pursuant to Section 13 or 15(d) of the Securities Exchange Act on 1934, Form 10-Q, November 3, 2014, p. 66.

[106] Enbridge Energy Partners, L.P., *Enbridge Energy Partners, L.P. Third Quarter 2010 Earnings*, Slide presentation, October 28, 2010, p. 8, http://phx.corporate-ir.net/External.File?item=UGFyZW50SUQ9MjY2NzE3N3xDaGlsZElEPTQwMTI5MXxUeXBlPTI=&t=1.

[107] Enbridge Energy Partners, L.P., November 3, 2014, p. 20.

[108] "Olympic Pipe Line, Others Pay Out Record $75 Million in Pipeline Explosion Wrongful Death Settlement," *Business Wire*, April 10, 2002.

[109] National Transportation Safety Board, *Pipeline Accident Report*, PAR-03-01, February 11, 2003.

[110] El Paso Corp., Quarterly Report Pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934, Form 10-Q, for the period ending June 30, 2002, Houston, TX, 2002.

[111] El Paso Corp., 2002.

> accident.[112] According to media reports, the company had previously signed settlements for $70 million with the city of San Bruno and over $500 million with victims' families because of the accident.[113]

The threat of safety enforcement penalties is often considered one of the primary tools available to pipeline safety regulators to ensure operator compliance with safety requirements. However, as the examples above suggest, pipeline safety fines on the order of $2.0 million for major violations, could still account for only a limited share of the financial impact of future pipeline releases. On the other hand, the authority of PHMSA to influence pipeline operations directly—for example, through corrective action orders or shutdown orders in the event of a pipeline failure—can have a large financial impact on a pipeline operator in terms of capital expenditures or lost revenues. Indeed, some have suggested that this operational authority is the most influential component of PHMSA's pipeline safety enforcement strategy.

Emergency Order Authority

As discussed earlier, PHMSA has authority to issue corrective action orders involving an individual pipeline operator or system in the event of an accident or safety violation. In recent testimony before Congress, the PHMSA Administrator advocated for emergency order authority as a "comprehensive enforcement tool to address time-sensitive, industry-wide safety conditions."[114] Such an emergency order could be issued without prior notice and would apply to all operators and/or pipeline systems facing a common safety concern. Such authority is currently granted to the Federal Railroad Administration, another agency within DOT, where an unsafe condition or practice "causes an emergency situation involving a hazard of death, personal injury, or significant harm to the environment" (49 U.S.C. 20104).

Outside advocates of emergency order authority for PHMSA have cited the San Bruno pipeline accident as a case where such authority could have been invoked to address safety concerns affecting "potentially a significant portion of the entire industry" which may not have been following necessary safety procedures.[115] In this case, PHMSA had authority only to issue its 2012 industry-wide advisory bulletins regarding MAOP records and reporting. Pipeline operators reportedly have expressed concerns about emergency order authority for PHMSA because such authority could, in their view, deprive pipeline operators of due process protections.[116] P.L. 114-183 (§16) grants PHMSA emergency order authority "only to the extent necessary to abate the imminent hazard." Upon a petition from an affected pipeline operator, such orders would be subject to initial review by the Secretary of Transportation and, if necessary, subsequent review in a federal district court on an expedited basis.

Unregulated Natural Gas Gathering Lines

Recent expansion of U.S. natural gas resources extracted from unconventional sources, primarily shale, has resulted in an unprecedented expansion of U.S. natural gas production. This rapid

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[112] California Public Utilities Commission, *Decision Different of President Picker on Fines and Remedies to be Imposed on Pacific Gas and Electric Company for Specific Violations in Connection With the Operation and Practices of its Natural Gas Transmission System Pipelines*, Item 33a Agenda ID #13818, April 9, 2015, p. 1.

[113] Dani Kass, "PG&E Says 45-Year-Old Charges Barred From Pipe Blast Case," *Law360*, July 28, 2015.

[114] Marie Therese Dominguez, February 25, 2016.

[115] Carl Weimer, Executive Director, Pipeline Safety Trust, Testimony before the House Committee on Energy and Commerce, Subcommittee on Energy and Power, Hearing on Pipeline Safety Reauthorization, March 1, 2016.

[116] "US House Panel Tackles PHMSA Emergency Powers," *Argus Media*, April 20, 2016.

growth of natural gas production is driving massive infrastructure investments by the U.S. gas industry. Such infrastructure includes new roads to access gas fields, well sites, drilling equipment, gathering pipelines to collect produced gas from the wells, processing facilities to separate the natural gas from other products, transmission pipelines to transport the gas long distances, and natural gas storage facilities. Intrastate gas gathering pipelines may account for a substantial share of these new investments. A 2014 INGAA Foundation study estimated that around 14,000 miles of new gas gathering lines would be constructed each year, on average, through 2035.[117]

Gathering pipelines in conventional natural gas production are typically smaller than interstate transmission pipelines—usually 20 inches or less in diameter. Lines of this size were expected to account for 45% of planned gas pipeline mileage in the United States in 2013.[118] However, due to differences in extraction techniques, gathering lines in some shale gas production areas exceed 20 inches in diameter and operate at higher pressure. Adding these larger gathering lines to the planned mileage above suggests that gathering lines overall actually may account for well above 50% of new pipeline mileage nationwide during the shale gas expansion.

The construction of shale gas gathering lines has raised safety concerns among federal officials because they may present a greater risk than older gathering lines due to their greater size and pressure. However, as noted earlier in this report, the vast majority of gas gathering lines—over 220,000 miles, mostly in rural areas—are excluded from federal pipeline safety regulations. As a PHMSA briefing paper stated in 2011, "the framework for regulating gas gathering lines may no longer be appropriate" because the physical characteristics of new shale gas gathering lines were "far exceeding the historical operating parameters of such lines."[119] The PHMSA website also states

> The lines being put into service in the various shale plays like Marcellus, Utica, Barnett and Bakken are generally of much larger diameter and operating at higher pressure than traditional rural gas gathering lines, increasing the concern for safety of the environment and people near operations.[120]

In a 2014 report, the Government Accountability Office (GAO) similarly concluded that recent increases in the size and pressure of shale gas gathering lines "raises safety concerns because they could affect a greater area in the event of an incident."[121] Federally unregulated shale gas gathering lines have also become an increasing concern among local governments and the general public in regions with heavy shale gas development.[122] The GAO report recommended that

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[117] INGAA Foundation, "North American Midstream Infrastructure through 2035: Capitalizing on Our Energy Abundance," Prepared by ICF International, March 18, 2014, http://www.ingaa.org/Foundation/Foundation-Reports/2035Report.aspx.

[118] Christopher E. Smith, "Worldwide Pipeline Construction: Crude, Products Plans Push 2013 Construction Sharply Higher," *Oil & Gas Journal*, February 4, 2013, Table 1.

[119] PHMSA, "Onshore Gas Gathering," briefing paper, March 24, 2011, http://www.phmsa.dot.gov/staticfiles/PHMSA/DownloadableFiles/Pipeline/Technical%20Advisory%20Committees/Tab%207b%20-%20Briefing%20-%20TPSSC%20Gas%20Gathering%20Lines%20-%20Dewitt.pdf.

[120] PHMSA, "Gathering Pipelines: Frequently Asked Questions," web page, May 6, 2016, http://phmsa.dot.gov/portal/site/PHMSA/menuitem.ebdc7a8a7e39f2e55cf2031050248a0c/?vgnextoid=4351fd1a874c6310VgnVCM1000001ecb7898RCRD&vgnextchannel=f7280665b91ac010VgnVCM1000008049a8c0RCRD&vgnextfmt=print#QA_2.

[121] U.S. Government Accountability Office (GAO), *Department of Transportation Is Taking Actions to Address Rail Safety,but Additional Actions Are Needed to Improve Pipeline Safety*, GAO-14-667, August 2014, summary page.

[122] Carl Weimer, Pipeline Safety Trust, Testimony before the House Committee on Energy and Commerce, Subcommittee on Energy and Power hearing on Oversight of the Pipeline Safety, Regulatory Certainty, and Job

PHMSA move forward with new regulations to address the safety risks of larger-diameter, higher-pressure gathering lines, including emergency response planning requirements that currently do not apply.[123]

In 2011, PHMSA published in the *Federal Register* an ANPRM to begin examining, among other things, whether new regulations are needed to govern the safety of natural gas gathering lines—with specific reference to shale gas lines.[124] Accordingly, PHMSA accepted written comments on potential rural gathering line regulations (through January 20, 2012). Among other comments, community stakeholders argued that new safety regulations are needed to take account of increased gathering line size and pressure. Some pipeline operators countered that gathering lines constructed in rural areas pose a minimal public risk, regardless of size or pressure, and that proximity to population—which already determines the regulatory status of a gathering line—should be the primary consideration. They further argued that the risk posed by any specific rural gathering line can be reclassified under current regulations should there be future encroachment of residential development on historically rural tracts where the pipelines had been constructed. Some gas producers are particularly concerned that increased safety costs could cause producers to cease producing from marginally profitable wells.

On March 17, 2016, PHMSA issued an NPRM which, among other provisions, would modify the regulation of onshore natural gas gathering lines. The proposed rules would repeal the existing reporting exemption for gas gathering lines and revise the definition of "gathering lines." The proposal would also extend to certain gathering lines with a diameter of eight inches or greater rules related to damage prevention, corrosion control, public education, maximum allowable operating pressure limits, line markers, and emergency planning.[125]

As the growth in shale gas gathering lines proceeds, related safety issues may remain a policy consideration for Congress. In particular, imposing and enforcing new safety regulations on thousands of miles of previously unregulated pipeline could require more funding for PHMSA and state pipeline safety agencies. In addition, because the safety impacts of gathering pipeline expansion are concentrated in areas of the country where shale gas is produced, balancing safety risks in these areas against the economic benefits may be an issue for Congress.

PHMSA Responsiveness to Congressional Mandates

As discussed earlier in this report, PHMSA has yet to complete a number of key mandates imposed by the Pipeline Safety Act. Some Members of Congress and other stakeholders have expressed frustration with the agency's failure to fulfill these mandates, in part because this failure delays important new safety regulations and in part because it does not allow Congress to evaluate the effectiveness of all the provisions in the Pipeline Safety Act as it considers PHMSA's reauthorization and new pipeline-related proposals.[126] PHMSA officials have testified that the delays do not reflect a lack of commitment but rather the complexity of the issues

Creation Act of 2011 and Related Issues, July 14, 2015.

[123] GAO, August 2014, p. 48.

[124] PHMSA, "Pipeline Safety: Safety of Gas Transmission Pipelines," 76 *Federal Register* 53086, August 25, 2011.

[125] PHMSA, "Pipeline Safety: Safety of Gas Transmission and Gathering Pipelines," 81 *Federal Register* 20723, April 8, 2016.

[126] See, for example: Representative Ed Whitfield, Chairman, statement before the House Committee on Energy and Commerce, Subcommittee on Energy and Power hearing on "Oversight of Pipeline Safety, Regulatory Certainty, and Job Creation Act of 2011 and Related Issues," July 14, 2015.

involved, the agency's rulemaking process, and limited staff resources.[127] P.L. 114-183 requires PHMSA to report regularly on outstanding statutory mandates (§3).

Additional Issues

In addition to the items mentioned above, Congress may consider several issues related to the federal pipeline safety program.

EPA Emissions Rules

As noted earlier, on May 12, 2016, the Environmental Protection Agency (EPA) issued new rules for reducing emissions of methane and volatile organic compounds (VOCs) from within the oil and natural gas industries.[128] These rules include sources of emissions from oil and gas pipelines. Although the EPA's objectives may be primarily directed at reducing greenhouse gas emissions, any regulation of uncontrolled methane or VOC releases from pipelines would likely have safety implications as well. These implications could affect both the pipeline operations and the costs to pipeline companies of fugitive emissions controls. The latter could be significant, as suggested by FERC and other stakeholders.[129] As implementation of EPA's new rules begins, Congress may seek to understand the implications of compliance on pipeline safety and any issues that may arise from imposing new EPA operational regulations on pipeline systems already regulated by PHMSA.

Old Pipelines in Natural Gas Distribution

According to the American Gas Association and other stakeholders, antiquated cast iron pipes in natural gas distribution systems, many over 50 years old, "have long been recognized as warranting attention in terms of management, replacement and/or reconditioning."[130] Old distribution pipes have also been identified as a significant source of methane leakage, which poses safety risks and contributes to U.S. greenhouse gas emissions.[131] In April 2015, Secretary of Energy Moniz reportedly stated that safety and environmental risks from old, leaky distribution lines were "a big issue."[132] Natural gas distribution system operators all have ongoing programs for the replacement of antiquated pipes in their systems, although some are constrained by state regulators who are reluctant to approve significant rate increases to pay for these upgrades. According to the Department of Energy, the total cost of replacing cast iron and bare steel distribution pipes is approximately $270 billion.[133] Practical barriers, such as urban excavation

[127] Stacy Cummings, Interim Executive Director, PHMSA, testimony before the House Committee on Energy and Commerce, Subcommittee on Energy and Power hearing on "Oversight of Pipeline Safety, Regulatory Certainty, and Job Creation Act of 2011 and Related Issues," July 14, 2015.

[128] Environmental Protection Agency, "EPA Releases First-Ever Standards to Cut Methane Emissions from the Oil and Gas Sector," press release, May 12, 2016.

[129] Federal Energy Regulatory Commission, Cost Recovery Mechanisms for Modernization of Natural Gas Facilities, 149 FERC 61,147, Docket No. PL15-10000, November 20, 2014, p. 7.

[130] American Gas Association, "Managing the Reduction of the Nation's Cast Iron Inventory," 2013, summary.

[131] Kathryn McKain et al., "Methane Emissions from Natural Gas Infrastructure and Use in the Urban Region of Boston, Massachusetts," Proceedings of the National Academy of Sciences, vol. 112, no. 7, pp. 1941-1946, February 27, 2015.

[132] Alan Neuhauser, "Moniz: Gas Pipelines a 'Very Obvious' Vulnerability," *U.S. News and World Report*, April 27, 2015.

[133] Department of Energy, QER, April 2015, p. 1-4.

and disruption of gas supplies, also limit annual replacement. Although the federal role in natural gas distribution systems is limited, because they are under state jurisdiction, there have been proposals in Congress and in the QER to provide federal support for the management and replacement of old cast iron pipe.[134] The Pipeline Safety Act mandated a survey (with follow-up every two years thereafter) of pipeline operator progress in adopting and implementing plans for the management and replacement of cast iron pipes (§7(a)). Congress may wish to examine the industry's progress in addressing the safety of antiquated distribution lines and opportunities for federal support of those efforts.

Public Perceptions of Pipeline Risks

Some stakeholders have argued that public perceptions of improved pipeline safety and control are the highest perceived benefit of remotely controlled or automatic valves.[135] Although the value of these perceptions is hard to quantify (and, therefore, not typically reflected in cost-effectiveness studies), the importance of public perception and community acceptance of pipeline infrastructure has long been a significant consideration in pipeline design, expansion, and regulation. In 2001, a representative of the National Association of Regulatory Utility Commissioners testified before Congress that "the main impediment to siting energy infrastructure is the great difficulty getting public acceptance for needed facilities."[136] Likewise, the National Commission on Energy Policy stated in its 2006 report that energy facility siting is "a major cross-cutting challenge for U.S. energy policy," largely because of public opposition to new energy projects and other major infrastructure.[137]

One result of public concern about pipeline safety has been to prevent new pipeline siting in certain localities, and to increase pipeline development time and costs in others. In a 2006 report, for example, the Energy Information Administration (EIA) stated that "several major projects in the Northeast, although approved by FERC, have been held up because of public opposition or non-FERC regulatory interventions."[138] In the specific case of the Millennium Pipeline, proposed in 1997 to transport Canadian natural gas to metropolitan New York, developers did not receive final construction approval for nine years, largely because of community resistance to the pipeline route.[139] Numerous other proposed pipelines, especially in more densely-populated areas such as New England, have faced similar public acceptance barriers. Controversy surrounding the proposed Keystone XL Pipeline project, the Algonquin Incremental Market (AIM) project, and the Constitution Pipeline are three recent examples of how the development of major pipeline projects may be influenced by public opinion. Even where there is federal siting authority, as is the case for interstate natural gas pipelines, community stakeholders retain many statutory and regulatory avenues to affect energy infrastructure decisions. Consequently, the public perception

[134] Department of Energy, April 2015, p. 2-38; The Pipeline Revolving Fund and Job Creation Act (S. 1209) introduced by Senator Markey and two cosponsors on May 6, 2015.

[135] U.S. Department of Transportation, September 1999, pp. 19-20.

[136] William M. Nugent, First Vice President, National Association of Regulatory Utility Commissioners, testimony before the Senate Energy and Natural Resources Committee hearing on Federal, State, and Local Impediments to Siting Energy Infrastructure, May 15, 2001.

[137] National Commission on Energy Policy, *Siting Critical Energy Infrastructure: An Overview of Needs and Challenges,* Washington, DC, June 2006, p. 1.

[138] Energy Information Administration, *Additions to Capacity on the U.S. Natural Gas Pipeline Network: 2005,* August 2006. p. 11.

[139] Federal Energy Regulatory Commission (FERC), "Commission Approves Revised $1 Billion Millennium Pipeline Project to Bring New Gas Service to the Northeast," press release, December 21, 2006. See, for example: Randal C. Archibold, "Fighting Plans for a Gas Pipeline: Not Under My Backyard," *New York Times,* August 7, 2001.

value of changes to safety regulation may need to be accounted for, especially with respect to its implications for general pipeline development and operations.

Conclusion

Both government and industry have taken numerous steps to improve pipeline safety over the last 10 years, but major pipeline incidents since 2010 suggest that there continues to be opportunity for improvement. The NTSB identified improvement of federal pipeline safety oversight as a "top ten" priority for 2013. The leading pipeline industry associations have concurred. The American Gas Association states that "its members are dedicated to the continued enhancement of pipeline safety."[140] The Association of Oil Pipe Lines likewise has stated that "the oil and natural gas industry is committed to achieving zero incidents throughout our operations."[141] Whether the ongoing efforts by industry, combined with additional oversight by federal agencies, will further enhance the safety of U.S. pipelines remains to be seen.

As Congress continues its oversight of the federal pipeline safety program, specific issues of interest may be the adequacy of PHMSA resources and staffing, safety of natural gas storage facilities, the use of emergency order authority, and the effectiveness of the agency's overall enforcement activities. An important focus may be the practical effects of the many changes being made to particular aspects of PHMSA's pipeline safety regulations. In addition to these specific issues, Congress may assess how the various elements of U.S. pipeline safety activity fit together in the nation's overall strategy to protect the public and the environment. Pipeline safety necessarily involves many groups: federal agencies, pipeline associations, large and small pipeline operators, and local communities. Reviewing how these groups work together to achieve common goals could be an overarching concern for Congress.

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[140] American Gas Association, "AGA's Commitment to Enhancing Safety: Revised February 2016," February 2016, https://www.aga.org/sites/default/files/commitment_to_enhancing_safety_february2016.pdf.

[141] Andrew J. Black, Association of Oil Pipelines, Testimony before the House Committee on Homeland Security Subcommittee on Transportation Security Hearing on "Pipelines: Securing the Veins of the American Economy," April 19, 2016.

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