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

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Summary

Altogether, the U.S. energy pipeline network is composed of over 2.9 million miles of pipeline transporting natural gas, oil, and other hazardous liquids. While an efficient and comparatively safe means of transport, many pipelines carry materials with the potential to cause public injury, costly destruction, and environmental damage. The nation's pipeline networks are also widespread and vulnerable to accidents. Recent pipeline accidents in Marshall, MI, San Bruno, CA, New York City, and Santa Barbara, CA, have heightened congressional concern about pipeline risks and drawn criticism from the National Transportation Safety Board. The Department of Energy's first *Quadrennial Energy Review* also highlighted pipeline safety as a growing concern for the nation's energy infrastructure. Both government and industry have taken numerous steps to improve pipeline safety over the last 10 years. Nonetheless, the spate of recent pipeline incidents suggests there continues to be opportunity for improvement.

The federal program for pipeline safety resides primarily with the Pipeline and Hazardous Materials Safety Administration (PHMSA) within the Department of Transportation (DOT), although its inspection and enforcement activities rely heavily upon partnerships with state pipeline safety agencies. PHMSA's appropriations are authorized through FY2015 under the Pipeline Safety, Regulatory Certainty, and Job Creation Act of 2011 (P.L. 112-90). The act contained a broad range of provisions addressing pipeline safety. Among the most significant were 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, and increase civil penalties for pipeline safety violations. In total, the act imposed 42 mandates on PHMSA regarding studies, rules, maps, and other elements of the federal pipeline safety program. While PHMSA has fulfilled many of these mandates, 16 remain incomplete, including several key mandates with potentially large impacts nationwide. In addition to these mandates, policymakers have expressed concerns about the adequacy of PHMSA's resources, the effectiveness of PHMSA's enforcement, its oversight of state pipeline safety programs, the potential regulation of currently unregulated gathering lines, and other regulatory issues.

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, it may assess how the various elements of U.S. pipeline safety fit together in the nation's overall strategy to protect the public and the environment. Pipeline safety necessarily involves many groups: federal agencies, oil and gas 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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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, costly 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, Pennsylvania, Montana, 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 with the Pipeline and Hazardous Materials Safety Administration (PHMSA) within the Department of Transportation (DOT), although its inspection and enforcement activities rely heavily upon partnerships with state pipeline safety agencies. Together, the federal and state pipeline safety agencies administer a comprehensive and complex set of regulatory authorities which has been changing significantly over the last decade and continues to do so.

The federal pipeline safety program is 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), which was signed by President Obama on January 3, 2012. This report reviews the history of federal programs for pipeline safety, significant safety issues, and recent developments focusing on key issues for Congress.

The U.S. Pipeline Network

Altogether, 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. Only around 7% of gathering lines are currently under federal jurisdiction (discussed later in this report) so the total mileage of U.S. gathering lines is not known more precisely. The natural gas transmission pipelines feed around 2.2 million miles of regional pipelines in some 1,400 local distribution networks serving over 67

[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, August 24, 2015, http://www.pipeline101.com/why-do-we-need-pipelines/other-means-of-transport.

million customers.[3] Natural gas pipelines also connect to 115 active liquefied natural gas (LNG) storage sites, 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	198,764
Natural Gas Gathering (federal)	17,620
Natural Gas Gathering (state)	223,000
Natural Gas Transmission	301,705
Natural Gas Distribution Mains and Service Lines	2,166,145
TOTAL	2,907,234

Source: PHMSA, "Annual Report Mileage Summary Statistics," web tables, August 3, 2015, http://www.phmsa.dot.gov/portal/site/PHMSA/menuitem.7c371785a639f2e55cf2031050248a0c/?vgnextoid=3b6c03347e4d8210VgnVCM1000001ecb7898RCRD&vgnextchannel=3b6c03347e4d8210VgnVCM1000001ecb7898RCRD&vgnextfmt=print; and "Gathering Pipelines: Frequently Asked Questions," web page, August 24, 2105, 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 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 14 deaths and 59 injuries annually caused by 34 pipeline incidents on average in all U.S. pipeline systems from 2005 through 2014.[6] This overall accident trend has been declining since 2005, with 28 such pipeline incidents in 2014 (**Figure 1**).

[3] Pipeline and Hazardous Materials Safety Administration (PHMSA), "Annual Report Mileage for Gas Distribution Systems," web table, August 3, 2015, http://www.phmsa.dot.gov/pipeline/library/data-stats/annual-report-mileage-for-gas-distribution-systems.

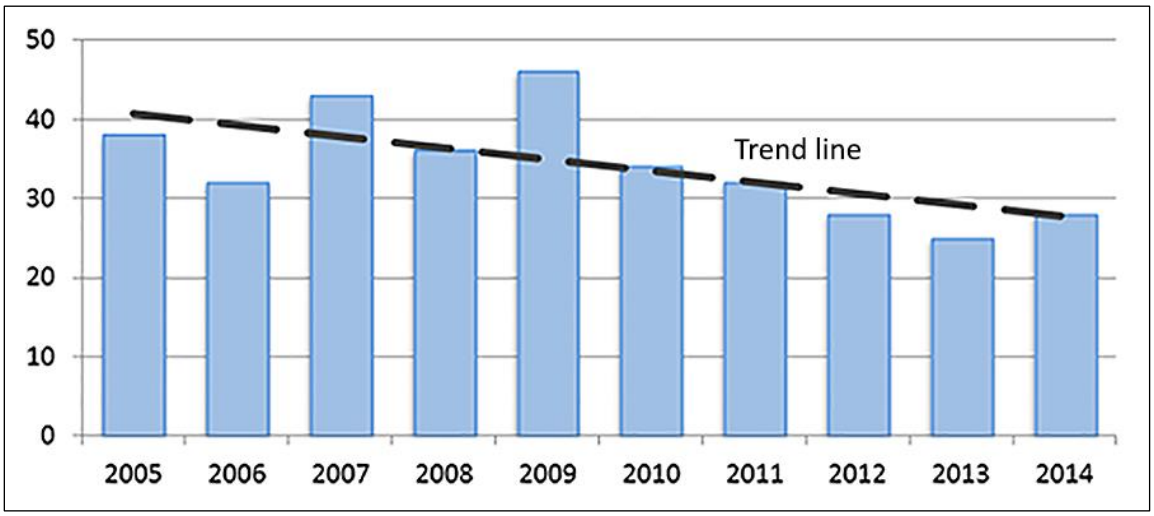
[4] PHMSA, "Liquefied Natural Gas (LNG) Facilities and Total Storage Capacities," web table, August 3, 2015, http://www.phmsa.dot.gov/pipeline/library/data-stats/liquefied-natural-gas-lng-facilities-and-total-storage-capacities.

[5] Bureau of Transportation Statistics, "Table 7-3 Distribution of Transportation Fatalities by Mode: 2007 and 2012," web table, 2013, http://www.bts.gov/publications/national_transportation_statistics/html/table_02_01.html; and "Table 7-4 Injured Persons by Transportation Mode: 1990, 2000, and 2005-2012," web table, 2013, http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/transportation_statistics_annual_report/2013/table7_4.html.

[6] PHMSA, "PHMSA Pipeline Incidents: (1995-2014), web table, August 24, 2015, 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 (1995-2014)," web chart, August 24, 2015, https://hip.phmsa.dot.gov/analyticsSOAP/saw.dll?Portalpages.

Notes: 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 and other physical impacts which may be significant—particularly in the case of oil spills or fires. PHMSA requires the reporting of such incidents caused by

- 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]

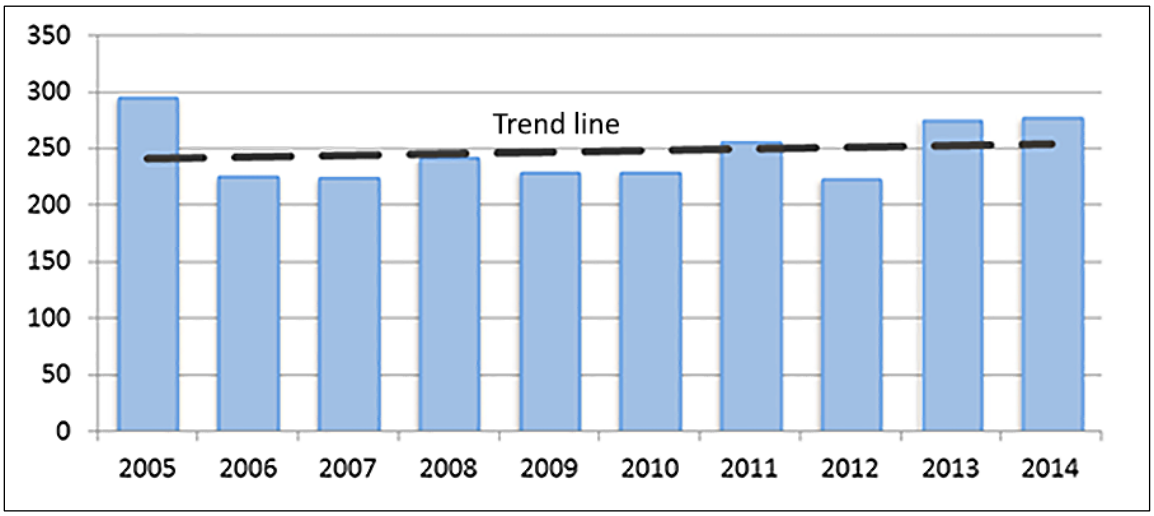
On average there were 248 such "significant" incidents (not involving injury or fatality) per year from 2005 to 2014. Unlike the trend for incidents harming people, the trend for incidents affecting only the environment or property has been almost flat over the last decade (**Figure 2**). It should be noted, however, that federally regulated pipeline mileage rose approximately 10% over this period, so both injury and enviromental incidents would show declining trends on a per-mile basis.[8]

[7] PHMSA, "Pipeline Incident Flagged Files," web page, August 24, 2015, 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, September 1, 2015, 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, August 24, 2015, 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.

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

- **1999—**A gasoline pipeline explosion in Bellingham, WA, killed three people and caused $45 million in damage to a city water plant and other property.
- **2000—**A natural gas pipeline explosion near Carlsbad, NM, killed 12 campers.
- **2006—**Corroded pipelines on the North Slope of Alaska leaked over 200,000 gallons of crude oil in an environmentally sensitive area and temporarily shut down Prudhoe Bay oil production.
- **2007—**An accidental release from a propane pipeline and subsequent fire near Carmichael, MS, killed two people, injured several others, destroyed four homes, and burned over 70 acres of grassland and woodland.
- **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 two five-story buildings.
- **2015**—A pipeline in Santa Barbara County, CA, spilled 3,400 barrels of crude oil, including 500 barrels which reached 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 and 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.

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*.[9]

At the end of FY2015, PHMSA employs 234 staff, including inspection and enforcement personnel and some support personnel.[10] 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.[11] According to the DOT, the states conduct approximately 80% of intrastate pipeline inspections under federal

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

[10] Artealia Gilliard, PHMSA, personal communication, September 18, 2015. Employees as of September 18, 2015.

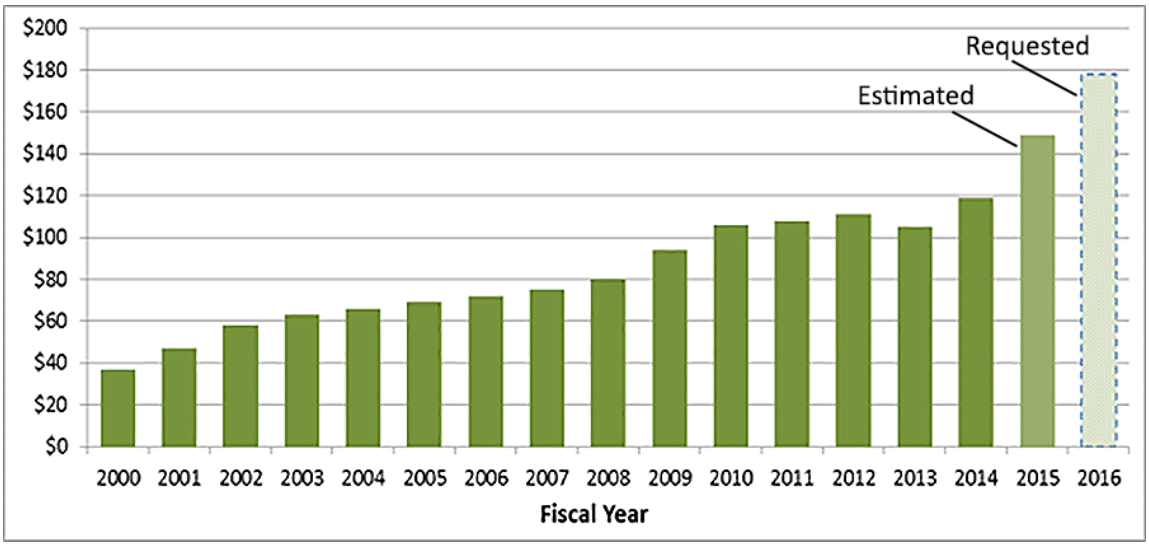
[11] 49 U.S.C. 60107.

authority, and a few states serve as agents for inspection of interstate pipelines as well.[12] There are approximately 330 full-time equivalent (FTE) state pipeline safety inspectors in 2015.[13]

PHMSA's pipeline safety program is funded primarily by user fees assessed on a per-mile basis on each regulated pipeline operator.[14] The agency's total annual budget authority has grown fairly steadily since 2000, with the most significant increase in FY2015 (**Figure 3**). For FY2015, PHMSA's total budget authority is approximately $149 million—more than double the agency's budget authority in FY2006. Under the President's FY2016 budget request, PHMSA's total budget authority for pipeline safety would increase again to an estimated $178 million.

Figure 3. PHMSA Pipeline Safety Total Annual Budget Authority 2000-2016

($ Millions)



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 2015 and 2016 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 2010 through 2014, PHMSA initiated 236 enforcement actions against pipeline operators.[15] Civil penalties proposed

[12] U.S. Department of Transportation, *Budget Estimates Fiscal Year 2016*, *Pipeline and Hazardous Materials Safety Administration*, 2015, p. 36, https://cms.dot.gov/sites/dot.gov/files/docs/FY2016-BudgetEstimate-PHMSA.pdf.

[13] Artealia Gilliard, September 9, 2015.

[14] 49 U.S.C. 60125.

[15] Pipeline and Hazardous Material Safety Administration (PHMSA), "PHMSA Pipeline Safety Program: Summary of Enforcement Actions," web page, August 5, 2015, http://primis.phmsa.dot.gov/comm/reports/enforce/Actions_opid_0.html?nocache=8828.

by PHMSA for safety violations during this period totaled approximately $29.4 million.[16] 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.

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 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.[17] 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.[18] 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.

[16] Pipeline and Hazardous Material Safety Administration (PHMSA), "PHMSA Pipeline Safety Program: Summary of Cases Involving Civil Penalties," web page, August 5, 2015, http://primis.phmsa.dot.gov/comm/reports/enforce/CivilPenalty_opid_0.html?nocache=9288#_TP_1_tab_1.

[17] 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).

[18] 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.

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 enforcement. The act mandated the promulgation by PHMSA of minimum standards for integrity management programs for natural gas distribution pipelines.[19] 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 that could 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. 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 new 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.[20] 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.[21]

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:

[19] 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.

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

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

- 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.

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.[22]

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."[23] 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.[24]

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.

[22] 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.

[23] 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.

[24] Ibid., p. 1.

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%.[25] The NTSB's "Most Wanted List" for 2013 called for enhanced pipeline safety through improved oversight of the pipeline industry.[26] In 2014, PHMSA took eight significant regulatory actions in response to NTSB safety recommendations.[27]

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.[28] 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.[29] 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."[30] 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."[31]

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

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

[27] NTSB, 2015, p. 1. Regulatory actions include final rules, notices of proposed rulemaking, (NPRMs), advanced notices of proposed rulemaking (ANPRMs), and advisory circulars (ACs).

[28] 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.

[29] 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.

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

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

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:

- 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,[32]
- 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.[33]

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.[34] 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,

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

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

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

- 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.[35]

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 is currently investigating the 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.[36]

Outstanding PHMSA Pipeline Safety Mandates

As stated earlier, the Pipeline Safety Act (P.L. 112-90) reauthorized PHMSA's pipeline safety activities through FY2015. In addition to this reauthorization, the act 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, 16 remain incomplete well beyond the deadlines specified in the act, including several key mandates with potentially large impacts on pipeline operations nationwide. The following sections provide a brief summary of six 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 and 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 either automatic shutoff valves (ASVs) or remotely controlled valves (RCVs).[37] 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

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

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

[37] 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.

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.[38] PHMSA states it is taking public comments and information from the other sources into consideration as it drafts a Notice of Proposed Rulemaking (NPRM) related to ASV and RCV installation and leak detection.[39] PHMSA submitted a report to Congress summarizing its actions to carry out this mandate on December 27, 2012. The Transportation, and Housing and Urban Development appropriations bill for FY2016 (H.R. 2577) reserves at least $1 million of PHMSA's budget for finalizing and implementing PHMSA's valve regulations.

Integrity Management Expansion and Class Location Replacement

> ... the Secretary of Transportation shall evaluate—(1) whether integrity management system requirements, or elements thereof, should be expanded beyond high-consequence areas; and (2) with respect to gas transmission pipeline facilities, whether applying integrity management program requirements, or elements thereof, to additional areas would mitigate the need for class location requirements. (§5(a))

This provision arises from congressional interest in expanding pipeline integrity management—including the use of the latest inspection technologies—beyond high-consequence areas as defined by regulation. As discussed above, HCAs are pipeline segments subject to more stringent standards for inspection and repair because, for example, they are in densely populated areas or near sites where people congregate or where they are confined (e.g., hospitals). Class locations are an older method of differentiating risk along gas pipelines based upon the number of buildings or dwellings adjacent to the pipeline route (i.e., Class 1 is rural, Class 4 is densely populated). Higher pipeline stress safety margins are required as class location (population density) increases.[40] This mandate seeks an examination of the extent to which HCAs can replace the class location system.

The statutory deadline for this mandate was July 3, 2013. PHMSA issued a Notice of Proposed Rulemaking in August 2013 seeking public comment on whether applying the integrity management program requirements, or elements of it, to areas beyond current HCAs would mitigate the need for class location requirements for gas transmission pipelines. The comment period ended November 1, 2013. PHMSA also held a "Class Location Methodology Workshop" in April 2014.

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

[38] 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.

[39] 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.

[40] PHMSA, "Pipeline Safety: Class Location," 78 *Federal Register* 46561, August 1, 2013.

> 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.[41] 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.... "[42]

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.[43] 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.[44] A draft rule was under agency review as of May 2015.[45]

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

[41] 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.

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

[43] 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.

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

[45] PHMSA, "Pipeline Safety, Regulatory Certainty, and Job Creation Act of 2011, Mandates by category in order of deadline," working table provided by PHMSA to committee staff, June 23, 2015, p. 4.

> (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."[46] 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.[47] With regard to local responders, in its initial investigation of the San 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."[48] 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.[49] The agency's website currently states that it "expects" such two hour notification.[50] 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.[51]

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 ASVs 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.[52]

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[46] 49 C.F.R. 191.5

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

[48] 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.

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

[50] PHMSA, "Incident Reporting," web page, June 29, 2015, http://www.phmsa.dot.gov/incident-report.

[51] 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.

[52] U.S. Department of Transportation, "DOT Issues Much-Anticipated Rules to Enhance Pipeline Safety," Office of (continued...)

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 Applications Other Than Single-Family Residences."[53] PHMSA published a NPRM on July 8, 2015, but a final rule has not been issued.[54]

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.[55] 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."[56] 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

(...continued)

Public Affairs, press release, December 3, 2009.

[53] 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.

[54] 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.

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

[56] 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.

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.[57] In 2012 PHMSA also issued advisory bulletins reminding pipeline operators (gas and liquid) to verify their MAOP records under existing regulations[58] and requiring gas pipeline operators to report when they exceed MAOP.[59] 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.[60] A proposed rule was submitted to the President's Office of Management and Budget for review on April 27, 2015.[61]

Key Policy Issues

In addition to the outstanding mandates of the Pipeline Safety Act, other, long-standing concerns, such as PHMSA inspector staffing 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 debates PHMSA's reauthorization through FY2019.

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 some two-thirds of inspectors in 2015 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

The President's most recent budget request reported PHMSA's estimated (funded) pipeline staffing in 2015 as 282 full-time equivalent (FTE) employees. The President's request would increase funded staff to 336 in FY2016. The funding of an additional 54 FTEs under the President's budget would amount to a significant increase in PHMSA staff growth (of mostly inspectors), continuing an expansion of the agency begun over 10 years ago in response to a series of industry developments, most notably the 1999 Bellingham 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 3**). Whether these increases in funded pipeline safety staff would yield the optimal number of pipeline safety inspectors remains to be seen. However, filling

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

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

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

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

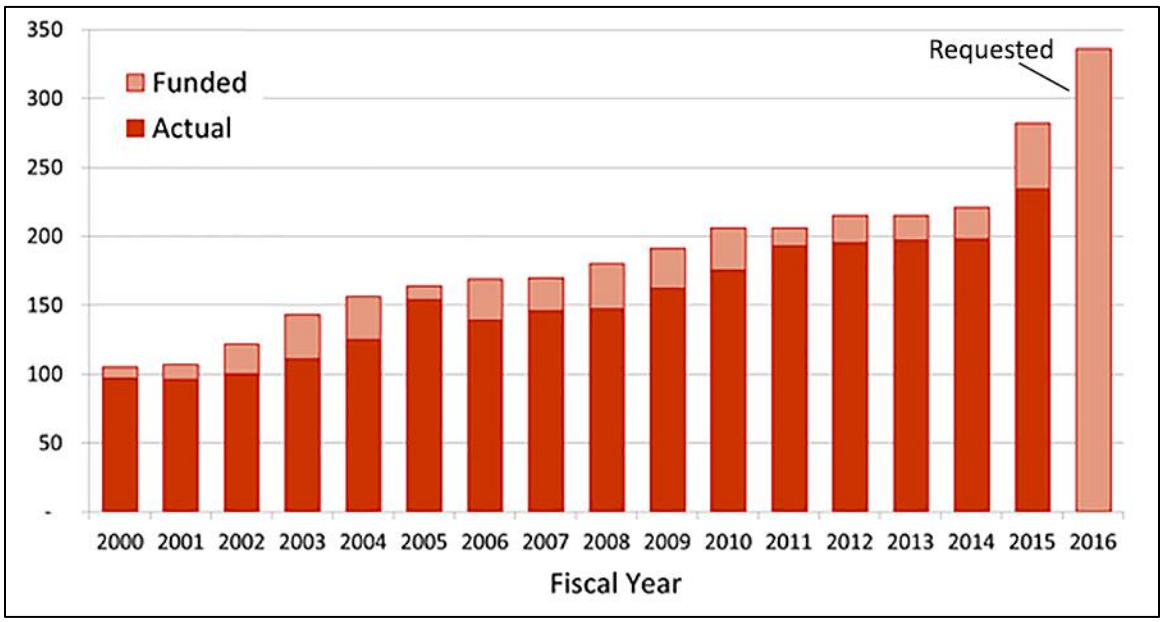
[61] PHMSA, June 23, 2015, p. 7.

these new positions, in addition to filling all previously authorized positions, and retaining the employees poses practical challenges for the agency.

One issue that has complicated 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 authorized funding for 191 employees ("estimated") for 2009. On this basis, from 2000 through 2015, the agency has reported a staffing shortfall averaging approximately 24 employees every year (**Figure 4**). Most of this staffing shortage has been among inspectors.

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 Years1996-2016; Artealia Gilliard, PHMSA, personal communication, September 9, 2015. Actual employee count for 2015 is as of September 9, 2015.

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.

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) are in high demand.[62]

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.[63]

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.[64] (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 of August 8, 2015, PHMSA had hired approximately 50% of 109 new positions (including 87 new inspection and enforcement staff) the agency received in its FY2015 appropriations.[65]

Direct-Hire Authority

One 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.[66]

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.[67]

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

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

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

[65] Artealia Gilliard, PHMSA, personal communication, September 9, 2015.

[66] 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.

[67] 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.

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.[68]

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 FY2016 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.[69]

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.[70] PHMSA officials in the past have also reportedly cited unfilled positions among state pipeline safety agencies as a risk to state pipeline safety programs.[71] 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.

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.[72] 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

[68] Artealia Gilliard, July 31, 2015.

[69] 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.

[70] 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.

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

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

> 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.[73]

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."[74] 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.[75] 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.[76] 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.

PHMSA Penalties and Pipeline Safety Enforcement

The adequacy of PHMSA's enforcement strategy has been an ongoing focus of congressional oversight.[77] 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."[78] 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)).[79] 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

[73] 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.

[74] Ibid. p. 10.

[75] Ibid. pp. 18-25.

[76] Ibid., p. 14.

[77] 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.

[78] 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.

[79] 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.

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.[80] According to the company, the agreement would require Kinder Morgan to spend approximately $26 million on additional integrity management activities, among other requirements.[81] 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 gasoline.[82] 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.[83]
- **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.[84] 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.[85] 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

[80] 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.

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

[82] 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.

[83] 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.

[84] 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.

[85] 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.

company had exceeded the aggregate limit of $650 million for pollution liability under its insurance policy.[86]

- **Olympic Pipe Line.** After the 1999 Bellingham 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.[87]
- **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.[88] Although the terms of those settlements were not disclosed, two additional lawsuits sought a total of $171 million in damages.[89] However, El Paso's June 2003 quarterly financial report stated that "our costs and legal exposure ... will be fully covered by insurance."[90]
- **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 accident.[91] 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.[92]

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, even raised to $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. Therefore, as Congress continues its oversight of PHMSA's enforcement activities, and as it considers new proposals to increase compliance with federal pipeline safety regulations, Congress may evaluate how PHMSA's authorities to set standards, assess penalties, and directly affect pipeline operations may reinforce one another to improve U.S. pipeline safety.

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. Absent any new constraints, unconventional gas is projected to become the dominant source of the U.S. natural

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

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

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

[89] 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.

[90] El Paso Corp., 2002.

[91] 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.

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

gas supply by 2040. This rapid 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. Of these infrastructure investments, new pipelines have received particular attention among policymakers because they are widespread and essential for transporting natural gas from producing regions to consuming markets. If the growth in U.S. shale gas continues as projected, the ultimate requirement for new pipelines could be very large. 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.[93]

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.[94] However, due to differences in extraction techniques, gathering lines in some shale gas production 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 and 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."[95] 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.[96]

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."[97] Federally unregulated shale gas gathering

[93] 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.

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

[95] 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.

[96] PHMSA, "Gathering Pipelines: Frequently Asked Questions," web page, August 25, 2015, http://phmsa.dot.gov/portal/site/PHMSA/menuitem.ebdc7a8a7e39f2e55cf2031050248a0c/?vgnextoid=4351fd1a874c6310VgnVCM1000001ecb7898RCRD&vgnextchannel=f7280665b91ac010VgnVCM1000008049a8c0RCRD&vgnextfmt=print#QA_2.

[97] 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.

lines have also become an increasing concern among local governments and the general public in regions with heavy shale gas development.[98]

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.[99] 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.

The GAO report recommended that 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.[100] The DOT generally concurred with the recommendations at the time.[101] Nonetheless, the agency has not set a deadline for any new rulemaking decisions. If PHMSA ultimately concludes that new safety regulations for federally unregulated pipelines are necessary, it would need to initiate another rulemaking process to determine what those new regulations should be. In the absence of PHMSA rules, states may act to impose their own safety regulations on gathering pipelines within their borders, as long as they do not conflict with any federal requirements.

As the growth in shale gas gathering lines proceeds, related safety issues may become a policy consideration for Congress—especially where both federal and state authority are involved or where the long-term interests of key stakeholders do not clearly align. 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 of shale gas development for the nation as a whole may be an issue for Congress.

Additional Issues

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

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

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

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

[101] Ibid. p. 59.

Responsiveness of PHMSA 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. 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.[102] PHMSA officials have testified that the delays do not reflect a lack of commitment but rather the complexity of the issues involved, the agency's rulemaking process, and limited staff resources.[103] At her nomination hearing before the Senate on July 22, 2015, the PHMSA Administrator expressed her commitment to ensuring the agency was as effective and responsive as possible.[104] Congress may continue to examine the agency's progress on the uncompleted mandates in the Pipeline Safety Act and gauge the agency's responsiveness to other issues of congressional interest as they arise.

Internal Inspection

As stated earlier in this report, some stakeholders propose increasing the requirements for pipeline operators to conduct internal inspections of transmission pipelines using "smart pigs," robotic devices sent through pipelines to take physical measurements continuously along the way.[105] In its San Bruno accident investigation report, the NTSB recommended that all natural gas transmission pipelines be configured to accommodate such internal inspection tools. However, experts note that there are different pipeline inspection techniques with overlapping capabilities and different strengths and weaknesses.[106] While an effective technology for detecting corrosion in many applications, smart pigs have limitations as a general tool for assessing the integrity of pipelines. For example, although smart pigs may be good corrosion detectors, they are still a developing technology and may be somewhat less effective in detecting other types of pipeline anomalies (e.g., cracks). Operators also maintain that smart pigging may be less useful for predicting future problems with pipeline integrity than other federally approved maintenance techniques like "direct assessment" (49 C.F.R. 192.903) wherein pipelines are examined externally based on risk data and other factors.[107] Furthermore, because many older pipelines contain sharp turns and other obstructions due to historical construction techniques, they cannot accommodate smart pig devices without significant and costly pipeline modifications to make them more "piggable." Consequently, some industry stakeholders caution against unrealistic expectations for the capabilities of smart pigs as a pipeline inspection tool.[108]

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[102] 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.

[103] 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.

[104] Marie Therese Dominguez, PHMSA, testimony before the Senate Committee on Commerce, Science, and Transportation hearing on her nomination to be the next administrator of the U.S. Department of Transportation's Pipeline and Hazardous Materials Safety Administration, July 22, 2015.

[105] "Pig" is the common industry acronym for "pipeline inspection gauge."

[106] Pete Carey, "Pipeline Inspection Not an Exact Science," *San Jose Mercury News*, October 11, 2010.

[107] The Pipeline Safety Improvement Act of 2002 (P.L. 107-355) directed the DOT to issue regulations on using internal inspection, pressure testing, and direct assessment to natural gas pipelines in high consequence areas.

[108] Christina Sames, Vice President, American Gas Association, November 4, 2010.

As an alternative to internal inspection where such inspection cannot currently be performed, some policymakers have called for mandatory hydrostatic testing of pipelines to verify their integrity. Hydrostatic testing involves filling a pipeline with water under pressure greater than the anticipated operating pressure to determine if it is structurally sound and does not leak. Such testing is common for new pipelines that have not yet entered service. Because it uses only water, hydrostatic testing poses relatively little direct risk to the public or the environment, but when used for operating pipelines it necessarily interrupts pipeline service. Injecting water into pipelines is also costly, and may create safety problems since water is corrosive and may be difficult to remove completely from a pipeline once testing is completed.[109] Nonetheless, as noted above, the NTSB has recommended that all natural gas transmission pipelines constructed before 1970 be subjected to hydrostatic pressure tests. P.L. 112-90 requires verification of maximum allowable operating pressure for all natural gas transmission pipelines "as expeditiously as economically feasible" (§23(a)). The act also authorizes regulations for pressure verification that "shall consider … pressure testing; and ... other alternative methods, including in-line inspections" (§23(a)). As Congress examines any new federal requirements for pipeline inspection, it may consider smart pig devices and hydrostatic testing as only two techniques in a portfolio of maintenance practices operators may need to employ to ensure their pipelines are physically sound.

Emergency Response Plan Disclosure

Federal regulations require pipeline operators to prepare emergency response plans for pipeline spills and to make those plans available for inspection by PHMSA and local emergency response agencies (49 C.F.R. 192.605). Some stakeholders have proposed that these plans also be made available to the public to allow for additional review of their adequacy and to provide better risk and response information to people living near pipelines.[110] Operators reportedly have resisted such disclosures on the grounds that their emergency response plans contain confidential customer and employee information.[111] They also raise concerns that the plans contain security-sensitive information about pipeline vulnerabilities and spill scenarios which could be useful to terrorists.[112] P.L. 112-90 requires PHMSA to collect and maintain copies of pipeline emergency plans for public availability excluding any proprietary or security-sensitive information (§6(a)). As oversight of this issue continues, Congress may consider the tradeoffs between public awareness and pipeline security in a general operating environment where both safety and security hazards may be significant.

Pipeline Water Crossings

The 2011 oil spill into the Yellowstone River near Laurel, MT, appears to have been the result of the buried oil pipeline becoming exposed due to scouring of the river bottom during unusually

[109] John Kiefner, "Overview of Hydrostatic Testing," presentation to the Hydrostatic Testing Symposium, California Public Utilities Commission, May 6, 2011, http://www.cpuc.ca.gov/NR/rdonlyres/1A47C67C-4398-49CA-B52A-A8B5CD13457B/0/HydrostaticTestingSymposiumPresentationMaterialsversiontopost.pdf.

[110] See, for example: Samya Lutz, Pipeline Safety Trust, "Another Pipeline Incident Anniversary—Have Things Changed Since 2009?," *The Smart Pig Blog*, May 8, 2015, http://smartpig.pstrust.org/.

[111] Sharon Theimer, "Government Lacks Copies of Emergency Response Plans Developed by Gas Pipeline Operators," Associated Press, October 6, 2010.

[112] Andrew Black, President, Association of Oil Pipe Lines, Remarks at the Different Pathways to a Common Goal: PIPA, Damage Prevention, and Greater Public Awareness and Involvement Conference, Pipeline Safety Trust, New Orleans, LA, November 5, 2010.

heavy flooding.[113] Prior to the flooding, a depth-of-cover survey by the operator verified that the pipeline was at least 5 feet below the riverbed, exceeding a 4-foot minimum cover requirement in PHMSA regulations.[114] Because the 4-foot requirement appears to have been insufficient to prevent riverbed pipeline exposure in this case, policymakers called for a review of pipeline river crossings and associated safety requirements nationwide.

P.L. 112-90 mandated a review of the adequacy of PHMSA regulations with respect to pipelines that cross inland bodies of water at least 100 feet wide and, based on the review's findings, required PHMSA to develop legislative recommendations for changing existing regulations (§28(a)). In November 2003, the agency issued a letter to Congress which "concluded that PHMSA's existing legislative authority is adequate to address the risks of hazardous liquid pipeline failures at major river crossings," and that PHMSA would "continue to look for ways to enhance our regulations, as appropriate, as we move forward."[115] Notwithstanding PHMSA's conclusions, some stakeholders continue to express concern about the adequacy of federal regulation of pipeline water crossings, not only for pipelines buried under river bottoms, but also for submerged pipelines—especially in the Great Lakes.[116] A proposed amendment (S.Amdt. 70) to the Keystone XL Pipeline Approval Act (S. 1) would have required certification that PHMSA has sufficient resources for, and would have mandated a study of special conditions of, pipelines in the Great Lakes. The safety of pipeline water crossings may continue to be a focus of Congress in the future.

EPA Emissions Rules

On August 18, 2015, the Environmental Protection Agency (EPA) issued proposed rules for reducing emissions of methane and volatile organic compounds (VOCs) from within the oil and natural gas industries.[117] These rules would 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.[118] As review of EPA's proposed rules continues, 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.

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[113] Rob Rogers, "Photo Shows Broken Silvertip Pipeline in Yellowstone River," *Billings Gazette*, September 7, 2011.

[114] Cynthia L. Quarterman, Administrator, PHMSA, testimony before the House Committee on Transportation and Infrastructure, Subcommittee on Railroads, Pipelines, and Hazardous Materials Hearing on the Silvertip Pipeline Oil Spill in Yellowstone County, Montana," July 14, 2001, p. 4.

[115] Cynthia L. Quarterman, Administrator, PHMSA, letter to Representative Bill Shuster, Chairman, House Committee on Transportation and Infrastructure, November 19, 2013.

[116] See, for example: State of Michigan, Department of Attorney General and Department of Environmental Quality, *Michigan Petroleum Pipeline Task Force Report*, July 9, 2015, http://www.michigan.gov/documents/deq/M_Petroleum_Pipeline_Report_2015-10_reducedsize_494297_7.pdf.

[117] Environmental Protection Agency, "Oil and Natural Gas Sector: Emission Standards for New and Modified Sources," Docket No. EPA-HQ-OAR-2010-0505, August 18, 2015.

[118] 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.

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."[119] 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.[120] In April 2015, Secretary of Energy Moniz reportedly stated that safety and environmental risks from old, leaky distribution lines were "a big issue."[121] 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 DOE, the total cost of replacing cast iron and bare steel distribution pipes is approximately $270 billion.[122] Practical barriers, such as urban excavation 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.[123] 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.[124] 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."[125] Likewise, the National Commission on Energy Policy stated in its 2006 report that energy facility siting is

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

[120] 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.

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

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

[123] 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.

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

[125] 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.

"a major cross-cutting challenge for U.S. energy policy," largely because of public opposition to new energy projects and other major infrastructure.[126]

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."[127] 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.[128] Numerous other proposed pipelines, especially in populated areas, have faced similar public acceptance barriers.[129] Controversy surrounding the proposed Keystone XL pipeline project is only the most recent example 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 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 has stated, for example, that "pipeline safety and integrity is the top priority for the natural gas industry."[130] The Association of Oil Pipe Lines likewise has stated that "while the liquids pipeline industry has made great strides to advance pipeline safety, there is much work underway to further improve pipeline safety performance."[131] 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, the effectiveness of the agency's enforcement activities, and 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

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

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

[128] 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.

[129] See, for example, Samantha Santa Maria, "Energy Projects: Rockies Express Add-on Pipe Projects Face Several Obstacles to Building in US Northeast," *Inside F.E.R.C.*, October 22, 2007.

[130] American Gas Association, "Utilities Work Towards Increased Safety for Natural Gas Infrastructure," press release, November 14, 2012.

[131] Andrew J. Black, Association of Oil Pipelines, Testimony before the House Committee on Energy and Commerce, Subcommittee on Energy & Power, hearing on "Oversight of Pipeline Safety, Regulatory Certainty, and Job Creation Act of 2011 and Related Issues," July 14, 2015.

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, oil and gas 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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