United States Government Accountability Office

Report to Congressional Requesters

November 2017

NATURAL GAS STORAGE

Department of Transportation Could Take Additional Steps to Improve Safety Enforcement Planning

GAO-18-89

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GAO Highlights

Highlights of GAO-18-89, a report to congressional requesters

Why GAO Did This Study

Natural gas storage is important for ensuring that natural gas is available when demand increases. There are 415 storage sites—including underground caverns and depleted aquifers and oil and gas reservoirs—located in 31 states, often near population centers (see fig.). Leaks from these sites, such as one near Los Angeles that led to the temporary relocation of about 8,000 families in 2015, can result in environmental and economic damage. Until 2016, states set standards for 211 sites, but there were no standards for 204 sites connected to interstate pipelines subject to federal jurisdiction. With passage of the PIPES Act of 2016, PHMSA, an agency within DOT that sets and enforces standards for energy pipelines, among other things, was tasked with issuing minimum standards for all gas storage sites.

GAO was asked to review natural gas storage safety standards. This report examines (1) PHMSA's efforts to implement the requirement to issue minimum safety standards for natural gas storage sites and (2) the extent to which PHMSA has planned strategically to enforce its safety standards for these sites. GAO reviewed PHMSA documents and plans, compared them to leading planning practices, and interviewed PHMSA officials.

What GAO Recommends

GAO is making two recommendations, which are that PHMSA (1) define levels of performance and address all core program activities and (2) use budget data to refine performance goals for its gas storage program. DOT concurred with GAO's recommendations.

View GAO-18-89. For more information, contact Alfredo Gómez at (202) 512-3841 or gomezj@gao.gov; or Frank Rusco at (202) 512-3841 or ruscof@gao.gov

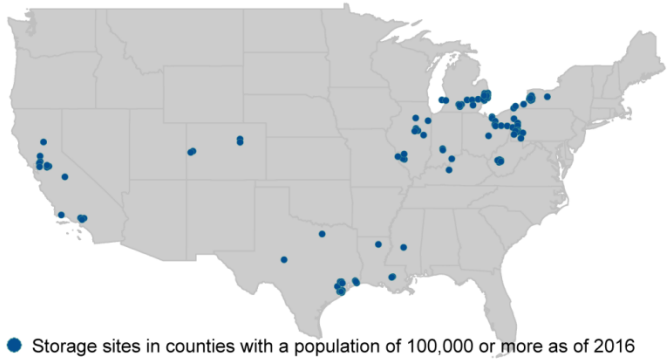
What GAO Found

To meet its requirement under the Protecting Our Infrastructure of Pipelines and Enhancing Safety (PIPES) Act of 2016, the Department of Transportation's (DOT) Pipeline and Hazardous Materials Safety Administration (PHMSA) issued minimum safety standards in an interim rule and plans to finalize them by January 2018. Under the interim standards, site operators are to follow industry-developed best practices to detect and prevent leaks and plan for emergencies, among other things. Since the interim rule went into effect in January 2017, the minimum safety standards apply to all 415 natural gas storage sites, and the rule will be subject to further revision before it is final.

To enforce its safety standards, PHMSA has taken steps to establish a natural gas storage safety enforcement program. For example, PHMSA has started developing a training program for its inspectors. PHMSA also has identified a strategic goal for its program—to promote continuous improvement in safety performance—and is developing a performance goal for its training program.

However, PHMSA has not yet followed certain leading strategic planning practices. For example, PHMSA has not yet defined the level of performance to be achieved, fully addressed all core program activities, or used baseline data to develop its performance goal. GAO has previously reported that requirements under the Government Performance and Results Act (GPRA) and GPRA Modernization Act of 2010—which include establishing performance goals to define the level of performance—can serve as leading practices for lower levels of an agency, such as PHMSA. GAO also has found that successful performance goals address all core program activities. PHMSA's goal focuses on training and does not address other core program activities, such as conducting effective inspections. For example, a goal to evaluate whether PHMSA's inspections are effective could be to annually reduce, by a certain percentage, the number of sites not meeting minimum standards. PHMSA officials told GAO that they will strive to add and refine performance goals as the program evolves. As they do so, ensuring that these goals define the level of performance, address all core program activities, and use baseline data could help PHMSA better track progress toward its strategic goal.

Approximate Location of Natural Gas Storage Sites within Counties Populated by 100,000 or More People



Storage sites in counties with a population of 100,000 or more as of 2016

Source: GAO analysis of Energy Information Administration and Census Bureau data. | GAO-18-89

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Abbreviations

API	American Petroleum Institute
BLM	Bureau of Land Management
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
EIA	Energy Information Administration
EPA	U.S. Environmental Protection Agency
FERC	Federal Energy Regulatory Commission
GPRA	Government Performance and Results Act of 1993
IRS	Internal Revenue Service
OMB	Office of Management and Budget
PHMSA	Pipeline and Hazardous Materials Safety Administration
PIPES Act	Protecting Our Infrastructure of Pipelines and Enhancing Safety Act of 2016

U.S. GOVERNMENT ACCOUNTABILITY OFFICE
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Congressional Requesters

Natural gas storage sites are key elements in our nation's energy system, helping ensure that natural gas, which is used for a range of applications such as heating homes and as a fuel to produce electricity, is available when demand peaks.[1] There are 415 active natural gas storage sites located in 31 states. These sites store natural gas in underground geologic formations such as caverns, depleted aquifers, and depleted oil and gas reservoirs.

Major leaks from these sites can result in serious economic disruption and environmental damage. Natural gas leaks can cause explosions or fires and, according to the Environmental Protection Agency (EPA), natural gas is considered to be a significant greenhouse gas which, if released, can pose significant environmental harm. One such leak occurred in 2015 at the Aliso Canyon Underground Storage Facility near the neighborhood of Porter Ranch in suburban Los Angeles, California. This leak released 5.4 billion cubic feet of natural gas into the atmosphere over the course of almost 4 months, which caused the temporary relocation of more than 8,000 families. In addition, the accident disrupted the ability of the Aliso Canyon site to deliver stored gas to electrical power plants, which in turn posed risks to the stability of California's electrical grid. Like the Aliso Canyon facility, many of the nation's natural gas storage sites are located within 3 miles of a city, town, or other populated area, according to the Department of Energy (DOE).

Until 2016, states had sole responsibility for overseeing the safety of the intrastate natural gas storage sites within their states, but states' safety standards for these sites varied and applied only to the intrastate sites that were wholly within their borders. In contrast, interstate natural gas storage sites were not covered by state regulations.[2] These interstate sites are subject to state and local permitting and federal licensing requirements, but they were not regulated for safety. Existing Department

[1]For the purposes of this report, the term "natural gas storage" refers to underground natural gas storage, which uses geological formations to store natural gas by injecting gas under high pressure.

[2]A site is considered to be interstate if the site is linked to a federally-regulated interstate pipeline.

of Transportation (DOT) safety regulations, which had been in place for more than 30 years, applied to conventional surface pipelines and above-ground equipment at all natural gas storage sites. However, these existing regulations did not apply to the underground portions of the sites, such as wells, wellbore tubing, and casing. In June 2016, the Protecting Our Infrastructure of Pipelines and Enhancing Safety (PIPES) Act of 2016 directed DOT to develop and issue minimum safety standards for all natural gas storage sites.[3] DOT's Pipeline and Hazardous Materials Safety Administration (PHMSA) develops and enforces these standards.

You asked us to review the development and enforcement of natural gas storage safety standards. This report examines (1) the status of PHMSA's efforts to implement the requirement under the PIPES Act to issue minimum safety standards for natural gas storage sites and (2) the extent to which PHMSA has planned strategically to enforce its safety standards for natural gas storage sites.

To examine the status of PHMSA's efforts to implement the requirement under the PIPES Act to issue minimum safety standards for natural gas storage sites, we interviewed agency officials and examined laws, regulations, and agency documents that describe the authority, time frames, and enforcement goals for implementing new federal standards under the PIPES Act. To examine the extent to which PHMSA has planned strategically to enforce its safety standards for natural gas storage sites, we examined PHMSA's policies, guidance, and plans and interviewed agency officials about their plans for oversight. We compared PHMSA's plans with leading practices for strategic planning identified by our prior work. Strategic planning is a systematic process for defining desired outcomes and translating this vision into goals and steps to achieve them. For more information on our objectives, scope, and methodology, see appendix I.

We conducted this performance audit from November 2016 to November 2017 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

[3]Pub. L. No. 114-183, § 12 (2016).

Background

This section discusses the purpose, types, and locations of natural gas storage sites; leaks from such sites; safety enforcement prior to 2017; and the PIPES Act.

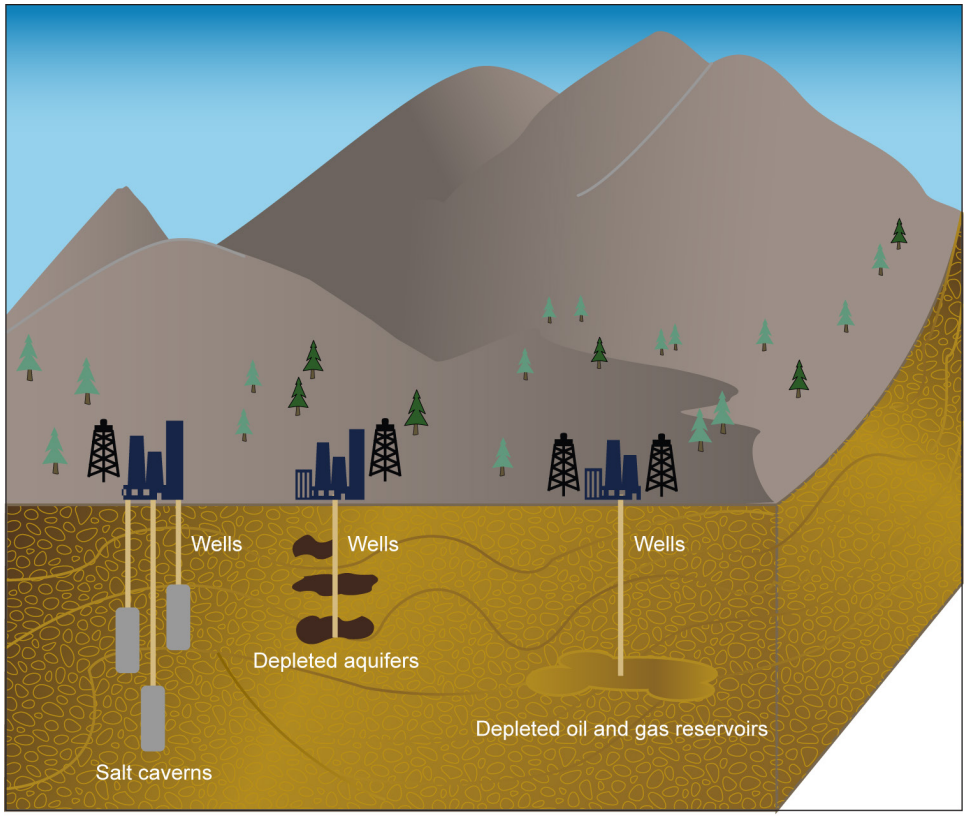
Purpose, Types, and Locations of Natural Gas Storage Sites

Natural gas storage sites—geologic formations where natural gas is stored deep underground and retrieved for later use—are key parts of our energy system. Natural gas provides about 30 percent of U.S. energy needs, is used to generate a third of the nation's electricity, is widely used for heating homes and businesses, and is used in a variety of industrial processes, according to Energy Information Administration (EIA) information. Natural gas storage sites provide a way to meet peak energy needs—such as during a cold spell in the winter or during periods of high electricity demand in the summer—more quickly than would be possible if relying solely on pipelines that transport natural gas from distant production fields. Natural gas storage sites are privately owned and operated by a variety of companies in the energy industry, including local utilities, independent companies that store gas for sale at peak times to other companies, and interstate pipeline companies.

There are three major types of underground geologic formations where natural gas storage sites are found: (1) underground salt caverns, (2) depleted aquifers, and (3) depleted oil and gas reservoirs.[4] The wells that inject or withdraw natural gas from the underground formations can extend thousands of feet underground. The 415 natural gas storage sites in the United States contain about 17,000 wells, ranging from a few wells per site to over a hundred wells at some larger sites. Figure 1 illustrates the types of geologic formations where natural gas storage sites are constructed and operated.

[4]According to EIA, the most commonly used underground storage sites are depleted oil and natural gas reservoirs, which are widely available; depleted aquifers are also widely available but are often more expensive to develop than depleted oil and gas fields. Storage operators can also store natural gas in abandoned mines and hard rock caverns.

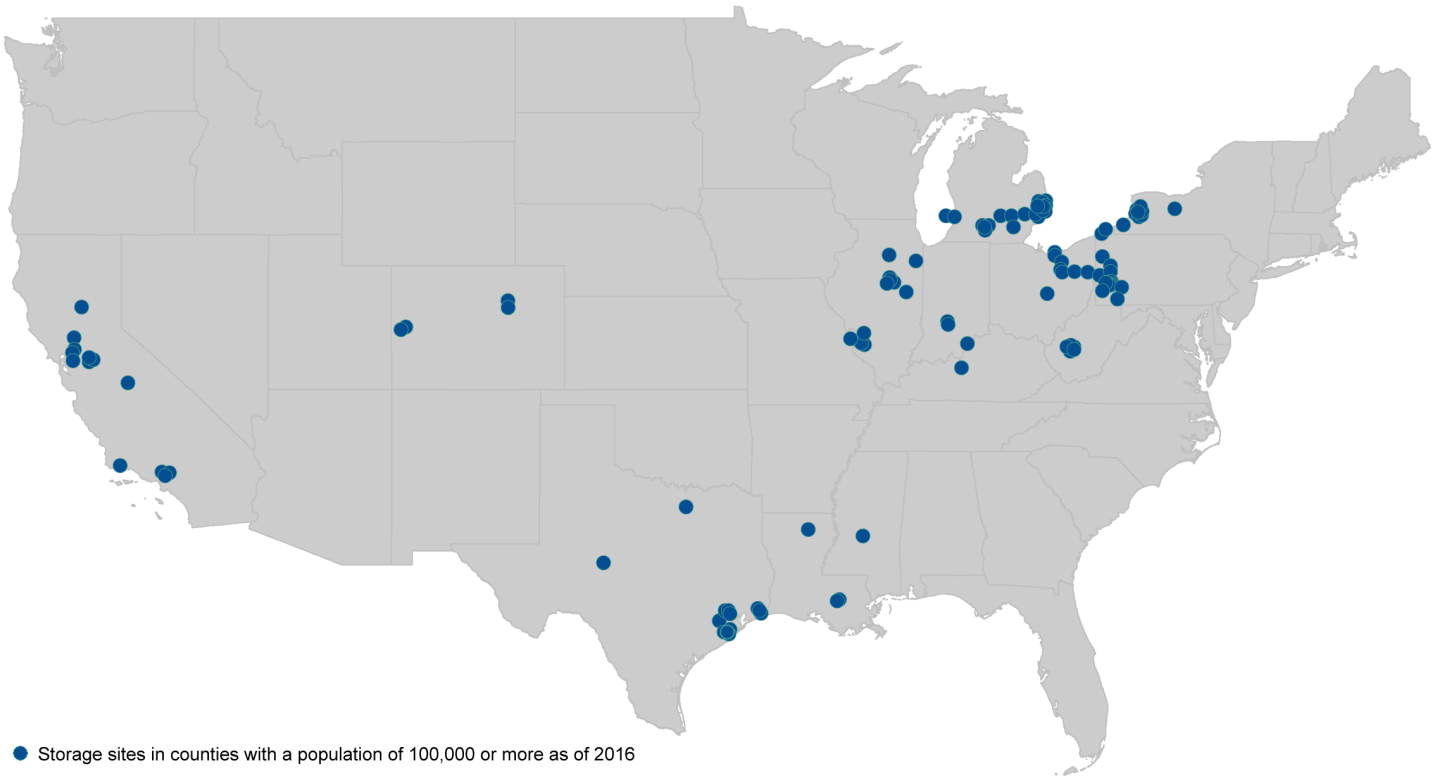
Figure 1: Major Types of Geologic Formations where Natural Gas Storage Sites Are Located



Source: GAO Analysis of Energy Information Administration information. | GAO-18-89

Natural gas storage sites are found in 31 states across the country, according to EIA data. Over 300 cities, towns, and other populated areas are located near a natural gas storage site, according to a DOE analysis. Operators often locate natural gas storage sites near major population centers or large gas pipelines to improve their ability to deliver natural gas when needed. Figure 2 shows the approximate location of natural gas storage sites located within counties populated by 100,000 or more people.

Figure 2: Approximate Location of Natural Gas Storage Sites within Counties Populated by 100,000 or More People



Source: GAO analysis of Energy Information Administration and Census Bureau data. | GAO-18-89

Note: The circles on the map represent the approximate locations of natural gas storage sites based on the centers of the counties; they do not represent their exact size and boundaries. Alaska is not shown because the sites there are not within counties of 100,000 people or more, and Hawaii does not appear because it has no natural gas storage sites.

Leaks from Natural Gas Storage Sites

Leaks from natural gas storage sites can be caused by a variety of factors—such as underground fissures or inadequately designed or damaged wells—and have the potential to affect human health, cause economic disruption, and harm the environment. For example, natural gas poses the risk of explosion and asphyxiation within enclosed spaces. In addition, other components of natural gas can cause short-term neurological, gastrointestinal, and respiratory symptoms, according to the Los Angeles County Department of Public Health.[5] Moreover, if a large

[5]Los Angeles County Department of Public Health, Interim Director, *Aliso Canyon Gas Leak Incident and Potential Public Health Implications,* Memorandum to the Los Angeles County Board of Supervisors (Los Angeles, Calif.: Dec. 1, 2015).

gas storage facility unexpectedly goes offline due to a major leak, it can disrupt the natural gas supply system, which in turn may affect the flow of gas to heat homes and businesses or may cause electrical blackouts due to the loss of fuel for gas-fired electrical generators. According to a DOE report,[6] the natural gas stored in geologic formations is under high pressure and may find its way to the surface if underground fissures or unplugged oil and gas wells allow the geologic formation to be breached. Leaks can also occur if the wells used to inject and withdraw natural gas from geologic formations lose integrity due to cracking of cement used to seal the well or other factors. Older wells used for natural gas storage were often drilled for other reasons, such as oil and gas production, and are more likely to have age-related degradation, according to DOE. About half of the about 17,000 wells that inject and withdraw natural gas from storage sites are more than 50 years old, and many wells are more than 100 years old, according to DOE. In addition, DOE reported that other factors may contribute to leaks, such as earthquake activity, nearby drilling activity, or other mechanical stresses and undetected corrosion that may not be known by the natural gas storage site operators. Further, DOE has reported that operators can sustain safety by regularly maintaining site equipment, monitoring and repairing leaks, keeping records about the site, and planning for possible emergencies, among other things.

Leaks from natural gas storage sites can result in significant and harmful effects on public health and safety, the environment, and the energy system. DOE, PHMSA, and others have identified three major leaks from natural gas storage sites since 2000 that illustrate these potential negative effects:

- The Aliso Canyon leak, which was detected in October 2015 and continued for nearly 4 months, focused national attention on natural gas storage safety. As of August 2017, the cause of the leak had not been conclusively determined. However, the leak occurred in a well that, at the time, was about 60 years old, according to DOE.[7] The

[6]U.S. Department of Energy, *Ensuring Safe and Reliable Underground Natural Gas Storage: Final Report of the Interagency Task Force on Natural Gas Storage Safety* (Washington, D.C.: Oct. 24, 2016).

[7]The operator had performed a "workover" operation on the well about 40 years ago. Workovers refer to one or more operations that may involve cleaning out sand from a well, repairing the piping in a well, and other activities, often to increase the productivity of the well.

operator of the Aliso Canyon site unsuccessfully attempted to stop the leak several times over the 4-month event and eventually was able to do so in February 2016 by permanently sealing the well. According to the private operator, it temporarily relocated about 8,000 neighboring families until the leak was abated. Also, the leak disrupted the Aliso Canyon site's ability to supply natural gas to electricity generating plants. Because the Aliso Canyon site supplies gas for nearly 10 gigawatts of electricity in the Los Angeles basin, the leak led to concerns that there may not be enough gas to serve the electricity needs of the surrounding region during peak times. In July 2017, California state regulators announced that the operator had conducted a comprehensive safety review and that the regulators would allow Aliso Canyon to reopen at a greatly reduced capacity in order to prevent energy shortages.

- In August 2004, the Moss Bluff natural gas storage site in Liberty County, Texas, experienced a major leak due to a damaged well. The leaking gas caught fire and burned for over 6 days, according to DOE and PHMSA documents. As a result, the gas was released into the atmosphere as carbon dioxide, which, according to an EPA analysis, is a less potent greenhouse gas than natural gas, which was released by the Aliso Canyon leak.
- In January 2001, the Yaggy natural gas storage site leaked through underground fissures from the site's salt caverns into the nearby city of Hutchinson, Kansas, eventually causing an explosion in the city's downtown business district, DOE reported. Two people were killed, and several businesses were damaged or destroyed by the explosion.

Safety Enforcement for Natural Gas Storage Sites Prior to 2017

Before 2017, many natural gas storage sites were subject to varied, state-by-state safety enforcement. States were responsible for regulating and enforcing safety at sites that were located solely within their boundaries and only linked to pipelines within the state. Agencies representing 26 state governments licensed 211 such sites, which amounted to about half of the 415 active sites in the United States. Prior to 2017, these state governments applied various safety standards that addressed underground conditions, such as the integrity of the geologic formations that store natural gas, or the construction and maintenance of wells that inject and withdraw gas. For example, according to a DOE report,[8] some states' standards specified how site operators should safely construct the

[8]U.S. Department of Energy, *Ensuring Safe and Reliable Underground Natural Gas Storage: Final Report of the Interagency Task Force on Natural Gas Storage Safety*.

wells. Other states' standards specified how wells were to be maintained during their useful life, or how they were to be safely plugged and abandoned after their useful life ended.

Prior to 2017, the remaining 204 interstate natural gas storage sites were subject solely to federal oversight. However, the federal government had not issued safety standards for them. The Federal Energy Regulatory Commission (FERC) licenses storage sites that serve the interstate natural gas market—a market regulated by FERC. However, according to FERC, its licensing process focuses on whether a proposed site serves an economic need, and it does not review the safety conditions of a site when reviewing whether to grant a license. In this role, FERC has licensed 204 sites in 24 states. As part of its mission to ensure the safety of the interstate natural gas pipeline system—of which natural gas storage sites are a part—PHMSA had the regulatory authority to issue and enforce safety standards for interstate natural gas storage sites. However, PHMSA's interstate pipeline safety regulations did not extend to underground natural gas storage facilities, even when connected to interstate pipelines. Moreover, because interstate sites were under federal jurisdiction, state safety standards could not be applied to such sites.[9]

Other federal agencies had responsibilities that addressed limited aspects of safety at natural gas storage sites. DOE provided technical assistance to California during the Aliso Canyon incident, and has researched the effects of natural gas storage leaks on the reliability of the electricity grid. The Bureau of Land Management (BLM), within the Department of the Interior, manages public lands that overlap, either partially or fully, with 33 natural gas storage sites.[10] EPA provides funding and oversight to help states and local pollution control agencies meet their responsibility to monitor air quality within their jurisdictions, according to EPA officials. EPA can also provide its expertise and support to states and local communities in the event of natural gas storage leaks, as it did during the leak at Aliso Canyon. However, EPA does not regulate underground conditions at gas storage sites.

[9]See *Colo. Interstate Gas Co. v. Wright*, 707 F. Supp. 2d 1169 (April 13, 2010).

[10]PHMSA officials stated that storage sites on BLM land are subject to the new PIPES Act standards.

The PIPES Act

In June 2016, Congress passed and the President signed the PIPES Act, which, among other things, directed DOT to establish minimum safety standards for all natural gas storage sites by June 2018 after considering recommendations from a federal task force and industry standards. PHMSA sets and enforces these standards.

The PIPES Act also directed DOE to establish and lead the task force,[11] which was charged with analyzing the Aliso Canyon incident and making recommendations to reduce the occurrence of similar incidents in the future. The task force published its report in October 2016.[12] The report included findings in three areas—well integrity, environmental and health protection, and energy reliability. The report also made 44 recommendations to enhance natural gas storage safety, including 3 key recommendations:

- Operators of natural gas storage sites should make advance preparations with appropriate federal, state, and local governments to mitigate potential future leaks.
- Electrical grid operators should prepare for the risks that potential gas storage disruptions create for the electric system.
- Operators of natural gas storage sites should begin a rigorous program to evaluate the status of the wells, establish risk management planning, and, in most cases, phase out old wells with single-point-of-failure designs.

The PIPES Act directed DOT to consider industry consensus standards to the extent practicable in establishing its minimum safety standards. Consensus standards for the oil and gas industry—including those for natural gas storage—are issued by various entities, including the American Petroleum Institute (API). API consensus standards describe how to safely perform technical procedures, such as drilling wells for oil and gas production, refining produced natural gas into usable gas for

[11]In April 2016, DOE and PHMSA formed a task force to examine the Aliso Canyon incident and to develop recommendations on how similar incidents could be prevented in the future. The PIPES Act formalized the task force by statute.

[12]U.S. Department of Energy, *Ensuring Safe and Reliable Underground Natural Gas Storage: Final Report of the Interagency Task Force on Natural Gas Storage Safety*. The task force also reported that the cause of the leak had not yet been conclusively determined. A separate technical root cause analysis is being conducted under the direction of California state regulators, and was ongoing as of August 2017, according to PHMSA officials.

heating and electricity generation, and conducting "workover" operations to refurbish existing wells. API develops its consensus standards involving industry, manufacturers, engineering firms, the public, academia, and government, and API's recommended practices are frequently adopted by a majority of the industry, according to API and PHMSA. Following several years of study and discussion by industry experts and government officials, including participation by PHMSA, API issued two documents outlining recommended practices for the development and operations of natural gas storage sites.[13] These recommended practices describe the procedures for designing, locating, constructing, and operating natural gas storage sites, and include such activities as inspecting and testing the wells used to inject and withdraw gas from natural gas storage sites and monitoring the integrity of the underground formations where natural gas is stored. The API documents also recommend that operators prepare for emergencies and train the personnel who operate the sites.

Under the PIPES Act, state governments also have a continuing role in enforcing natural gas storage safety for the sites in their states. The act allows states to certify with PHMSA that they have adopted state standards that meet or exceed the federal standards and can enforce these standards.[14] Once a state certifies that it has met these conditions, the state is responsible for enforcing safety standards on state-regulated intrastate natural gas underground storage sites through inspections conducted by state employees, according to PHMSA officials. In addition, PHMSA officials told us that they would periodically assess whether states are meeting these conditions. PHMSA officials told us that PHMSA will have direct responsibility for inspecting federally-licensed interstate facilities for the next few years because federal safety standards are still being established, but officials noted that state inspectors could eventually seek permission from PHMSA to assume the role of inspecting interstate natural gas storage sites on behalf of PHMSA in the future. PHMSA officials also noted that PHMSA does not force states to participate in their pipeline safety program, and so in cases where a state chooses not to certify its safety enforcement program, PHMSA has stated

[13]American Petroleum Institute, *API Recommended Practice 1170: Design and Operation of Solution-mined Salt Caverns Used for Natural Gas Storage*, 1st ed. (Washington, D.C.: July 2015), and *API Recommended Practice 1171: Functional Integrity of Natural Gas Storage in Depleted Hydrocarbon Reservoirs and Aquifer Reservoirs*, 1st ed. (Washington, D.C.: September 2015).

[14]Pub. L. No. 114-183, § 12(b) and 49 U.S.C. §§ 60105 and 60106.

that it will assign its own inspectors and staff to enforce federal natural gas storage safety standards in that state. The PIPES Act also requires PHMSA to set and charge user fees to operators that it can use for activities related to underground natural gas storage facility safety, subject to the expenditure of these fees being provided in advance in an appropriations act.[15]

PHMSA Has Issued Interim Safety Standards and Plans to Finalize Them by January 2018

Citing an urgent need to improve safety at natural gas storage sites, PHMSA issued an interim final rule that includes minimum safety standards based largely on API recommended practices in December 2016. The rule took effect in January 2017 and provided that existing facilities (and those constructed by July 18, 2017) must meet the standards by January 18, 2018. PHMSA is now considering public comments on its interim standards, and it plans to finalize them by issuing a final rule by January 2018. PHMSA also has stated that it will delay enforcement of certain standards in the interim final rule until 1 year after issuance of the final rule.[16]

PHMSA Has Issued Minimum Standards in an Interim Final Rule

To meet the requirement under the PIPES Act, PHMSA issued minimum safety standards for natural gas storage through an interim final rule in December 2016,[17] which took effect in January 2017.[18] PHMSA issued the interim final rule—which allowed the safety standards to take effect more quickly than under the conventional regulatory process—and stated that any delay in adopting the standards would jeopardize the public

[15]Pub. L. No. 114-183, § 12(c).

[16]Department of Transportation Pipeline and Hazardous Materials Safety Administration, *Notice: Pipeline Safety: Safety of Underground Natural Gas Storage Facilities; Petition for Reconsideration*, 82 Fed. Reg. 28,224 (June 20, 2017).

[17]Department of Transportation Pipeline and Hazardous Materials Safety Administration, *Interim Final Rule: Pipeline Safety: Safety of Underground Natural Gas Storage Facilities*, 81 Fed. Reg. 91,860 (Dec. 19, 2016)(codified at 49 C.F.R. parts 191 and 192).

[18]Typically, under the Administrative Procedure Act, federal agencies issue a final rule after publishing a proposed rule in the *Federal Register* and collecting and evaluating public comments on the proposed rule. However, interim final rules can be made effective immediately if the agency determines there is "good cause" to find that the notice and comment process would be impracticable, unnecessary, or contrary to the public interest. Under this good cause exception, the agency provides an opportunity for public comment after the interim final rule's issuance. After an agency has collected and evaluated public comments, it can issue a final rule, which may be the same or similar to the interim final rule, or may be different.

interest through risks to public safety and the environment. As a result, all 415 natural gas storage sites are for the first time subject to federal regulation, including minimum safety standards as set forth in the interim final rule, and subject to revision in a final rule.

To develop the minimum safety standards, PHMSA considered industry consensus standards, as required by the PIPES Act. PHMSA had already advised operators to follow industry-recommended practices published by API, which develops consensus standards for the oil and gas industry. Specifically, in February 2016, before the passage of the PIPES Act, PHMSA issued a bulletin encouraging operators to follow the API recommended practices to update their safety programs.[19] The API recommended practices contain many provisions that are mandatory, and other provisions that are nonmandatory. The interim final rule provides that the nonmandatory provisions of the recommended practices that are incorporated by reference in the rule are adopted as mandatory. PHMSA's interim final rule requires operators of existing natural gas sites, and those constructed by July 18, 2017, to meet the requirements of certain sections of the API recommended practices identified in the rule by January 18, 2018. The API recommended practices address, among other things, general operations, monitoring the sites for potential leaks, and emergency response and preparedness. For new storage sites starting construction after July 18, 2017, the rule requires operators to meet all sections of the applicable API recommended practices.

According to PHMSA officials, PHMSA considered the recommendations of the task force in developing its minimum safety standards, as required by the PIPES Act, and continues to do so. PHMSA's minimum safety standards addressed certain recommendations made by the task force, according to an analysis performed by PHMSA. However, PHMSA did not require operators to implement one key recommendation of the task force report with its minimum standards, according to PHMSA officials. In particular, the October 2016 task force report recommended that operators phase out most storage wells with single-point-of-failure designs—where the failure of a single component, such as a well casing, could lead to a large release of gas—by installing multiple points of control at each well. According to an API official, its recommended practices do not direct operators to phase out such wells because this

[19]Department Of Transportation Pipeline and Hazardous Materials Safety Administration, *Advisory Bulletin ADB–2016–02: Pipeline Safety: Safe Operations of Underground Storage Facilities for Natural Gas*, 81 Fed. Reg. 6,334 (Feb. 5, 2016).

practice may not significantly improve safety in all cases; for example, this practice may not have prevented the leak at Aliso Canyon. The API official and PHMSA officials noted that API recommended practices direct operators to assess the risks at their sites and to take steps to address these risks. According to PHMSA officials, assessing the risks of a site could include identifying wells with a single point of failure and developing steps to mitigate this risk. Mitigating the risk could include installing multiple points of control for certain wells, among other possible mitigation steps.[20] Neither PHMSA nor API officials could tell us how many of the approximately 17,000 wells at the nation's 415 natural gas storage sites have single-point-of-failure designs, because this information has not been centrally gathered to date. However, PHMSA plans to gather information about how many storage wells have single-point-of-failure designs by asking operators to provide this information as part of a required annual report.[21]

To fund its enforcement of its minimum safety standards, PHMSA also issued a notice to set the user fees that PHMSA charges operators, as required by the PIPES Act. In November 2016, PHMSA published a notice of agency action and request for comment, describing its user fee structure.[22] PHMSA collected public comments, evaluated them, and finalized its user fee structure in April 2017.[23] As set forth in this notice, PHMSA will charge each operator based on the size of the operator's storage sites as measured by working gas capacity range. The notice

[20]According to the API official, this practice is an example of "performance-based language," which allows companies and sites to select the most appropriate manner to achieve compliance, based on their circumstances. API has noted that this practice has been shown to improve pipeline safety.

[21]PHMSA plans to require operators to annually report this information using PHMSA Form 7100.4-1. In its interim final rule, PHMSA required natural gas storage site operators to begin submitting these data using this form on or before July 18, 2017 (see 49 C.F.R. § 191.17). According to PHMSA officials, the Office of Management and Budget (OMB) has recently approved this form. As a result, PHMSA will begin collecting data that reflect calendar year 2017 by its due date of March 15, 2018.

[22]Department of Transportation Pipeline and Hazardous Materials Safety Administration, *Pipeline Safety: Underground Natural Gas Storage Facility User Fee*, Notice of agency action and request for comment, 81 Fed. Reg. 78,261 (Nov. 7, 2016). The notice states that it advises natural gas storage facility operators about its proposed PHMSA pipeline user fee assessment and rate structure.

[23]Department of Transportation Pipeline and Hazardous Materials Safety Administration, *Pipeline Safety: Underground Natural Gas Storage Facility User Fee*, Notice of agency action, 82 Fed. Reg. 16,874 (Apr. 6, 2017).

stated that PHMSA plans to collect a total of up to $8 million annually in fees from all operators combined; however, PHMSA may seek authority to increase or decrease the amount it charges operators if it finds that the cost of inspection and enforcement is more or less than it initially estimated, according to PHMSA officials. Following enactment of an appropriations act provision, PHMSA is authorized to use the fees it collects to fund its enforcement activities and plans to use a portion of the fees to reimburse states for enforcing its minimum safety standards, according to PHMSA officials.

Table 1 provides a timeline of key events in the development of PHMSA's minimum safety standards.

Table 1: Timeline of Key Events in the Development of the Pipeline and Hazardous Materials Safety Administration's (PHMSA) Minimum Standards for Natural Gas Storage Safety

Date	Event
July 2015 to September 2015	• The American Petroleum Institute (API) releases industry-recommended practices for natural gas storage
October 2015 to February 2016	• October 2015: A natural gas leak is detected at the Aliso Canyon Underground Storage Facility outside Los Angeles, California • November 2015: After several unsuccessful attempts to stop the leak at Aliso Canyon, the site operator begins drilling a second well to intercept and stop the leak underground • February 2016: The Aliso Canyon site operator completes the relief well and stops the leak
February 2016	• The Department of Transportation's (DOT) PHMSA advises operators to voluntarily follow API recommended practices
April 2016	• The Department of Energy (DOE) and PHMSA form a task force to examine the Aliso Canyon incident and to develop recommendations on how similar incidents could be prevented in the future
June 2016	• Congress passes and the President signs the Protecting Our Infrastructure of Pipelines and Enhancing Safety (PIPES) Act of 2016, which formalized by statute the task force formed by DOE and PHMSA to study natural gas storage safety, and directs DOT to issue minimum standards for natural gas storage safety
November 2016	• PHMSA publishes a notice of its proposed fee structure, stating that it plans to annually charge operators up to $8 million in fees to fund its enforcement work, and requests public comments
December 2016	• PHMSA issues an interim final rule containing minimum safety standards based on API recommended practices, and requests public comments on the standards
January 2017	• Interim final rule containing minimum safety standards goes into effect
April 2017	• PHMSA finalizes its fee structure for operators
June 2017	• In response to a petition for reconsideration, PHMSA publishes a notice stating that it intends to address the issues raised by comments it collected from industry and the public, and that it will not issue certain enforcement citations to operators until January 2019 • Following an appropriation provision allowing PHMSA to obligate up to $8 million from fees for its natural gas safety enforcement program, PHMSA collects about $2 million and plans to collect the remaining $6 million in the coming months

Source: GAO analysis of PHMSA publications and documents. | GAO-18-89

PHMSA Is Considering Comments on Its Interim Final Rule and Plans to Issue Final Safety Standards in January 2018

Since issuing its interim final rule, PHMSA has been collecting public comments and plans to adjust some aspects of the rule in response to comments from the public, industry representatives, and others. PHMSA plans to finalize its minimum safety standards by replacing its interim final rule with a final rule in January 2018, and has delayed some dates for when it expects operators to comply with some aspects of its standards. PHMSA's interim final rule states that, with respect to incorporation by reference of the standards, the nonmandatory provisions it adopted are adopted as mandatory provisions. API and two other organizations representing natural gas utilities and transmission companies submitted comments asking PHMSA to reconsider how it used the API

recommended practices in its minimum safety standards.[24] While API and the other industry representatives agreed that it was appropriate for PHMSA to use API recommended practices for its minimum safety standards, they stated that making all portions mandatory would make the standards burdensome. In June 2017, PHMSA published a notice in the *Federal Register* stating that it would consider these comments as it finalized its minimum safety standards, which it stated it expects to issue by January 2018. The notice stated further that PHMSA will not issue any enforcement citations to operators for failure to meet any standards that were nonmandatory but that were converted to mandatory by provisions of the interim final rule until 1 year after it issues the final rule.[25]

PHMSA also provided additional guidance and clarifications to operators about scheduling and its plans for enforcement. During the development of its interim final rule, PHMSA noted that some of the provisions in the minimum safety standards may take operators several years to fully implement. According to PHMSA officials, these provisions recommend that operators carefully inspect their natural gas storage sites, identify any conditions that do not meet industry-recommended practices, and then improve conditions at the sites by prioritizing the greatest risks and implementing preventative measures to mitigate and remediate these risks over a number of years. As a result, PHMSA published guidance on its website stating that it expects operators to make and implement plans to inspect and remediate risks found at their sites within 3 to 8 years following the effective date of the interim final rule.[26]

[24]See American Gas Association, American Petroleum Institute, American Public Gas Association, and Interstate Natural Gas Association of America, "*Petition for Reconsideration of 'Safety of Underground Natural Gas Storage Facilities Interim Final Rule,' 81 Fed. Reg. 91,860 (Dec. 19, 2016), Docket No. PHMSA-2016-0016*," Letter to PHMSA, January 18, 2017. On April 17, 2017, the Interstate Natural Gas Association of America withdrew from the petition for reconsideration.

[25]U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration, *Notice: Pipeline Safety: Safety of Underground Natural Gas Storage Facilities; Petition for Reconsideration*, 82 Fed. Reg. 28,224 (June 20, 2017).

[26]U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration, *Pipeline Technical Resources: Underground Natural Gas Storage: FAQs*, accessed August 1, 2017, https://primis.phmsa.dot.gov/ung/faqs.htm.

PHMSA Has Taken Steps to Establish an Enforcement Program but Has Not Yet Followed Certain Leading Practices of Strategic Planning

To enforce PHMSA's safety standards, the agency's officials have taken a variety of steps to establish a safety enforcement program for natural gas storage sites, but they have not yet followed certain leading practices of strategic planning in starting PHMSA's natural gas storage program.[27] Specifically, PHMSA officials have started developing a training program for natural gas storage inspectors. They also have established a strategic goal and begun developing a training performance goal for their natural gas safety enforcement program. However, they have not yet followed certain leading practices for strategic planning—the systematic process for defining desired outcomes and translating this vision into goals and steps to achieve them. For example, PHMSA's training performance goal does not define the level of performance officials hope to achieve or address all core program activities, such as conducting effective inspections. In addition, PHMSA has not used baseline data or budgetary information to inform the development of performance goals. PHMSA officials explained that they are still developing performance goals for their new program and collecting relevant data.

PHMSA Has Taken Steps to Establish a Natural Gas Storage Safety Enforcement Program

To enforce the agency's safety standards, PHMSA officials have taken a variety of steps to establish a safety enforcement program for natural gas storage sites by January of 2018. For example, PHMSA officials have started developing a training program for natural gas storage inspectors. They have identified learning objectives for the program and have begun developing learning materials. According to PHMSA officials, developing a training program for inspectors is central to safety enforcement efforts, in part because PHMSA has a limited number of staff members with expertise in natural gas storage. For example, PHMSA had 10 employees with natural gas storage experience as of August 2017, according to PHMSA officials. In addition, PHMSA officials have completed eight safety assessments of selected natural gas storage operators to document the initial condition of gas storage sites and safety practices. According to PHMSA officials, their methodology for conducting these

[27]PHMSA's oversight activities do not have a unique program activity code in the agency's budget, according to PHMSA officials. Fees collected from natural gas storage operators to fund natural gas storage oversight will be deposited in PHMSA's Underground Natural Gas Storage Facility Safety account. Subsequently, obligations made for natural gas storage oversight activities will be tracked as separate subareas within the Pipeline Safety Program's program activity codes for operations and grants. However, in consultation with PHMSA, for the purposes of this report we have referred to PHMSA's oversight activities as a program.

assessments involved visiting a cross section of operators, including operators of interstate and intrastate sites and multiple types of facilities.

PHMSA officials also have developed workload and budget estimates for their new program, according to PHMSA documentation. In recent years, the Office of Pipeline Safety, which will be responsible for natural gas storage inspections in addition to pipeline inspections and other activities, has initiated about 1,100 inspections annually, according to PHMSA data. When natural gas storage site inspections begin, PHMSA officials estimate that the Office of Pipeline Safety's inspection workload could increase 14 percent due to their new responsibilities. They reached this estimate by dividing the 203 new natural gas storage units they anticipate needing to inspect by the total number of inspection units they currently inspect.[28] To meet the demands of this increased workload, officials estimate that PHMSA will need $2 million annually to fund 6 new inspector positions, training, travel, and other expenses associated with managing the natural gas storage safety enforcement program. With this number of inspectors, PHMSA officials believe that they can inspect all 203 natural gas storage units within about 4 years. Because PHMSA officials expect that many states that have previously conducted similar inspections will help PHMSA conduct inspections, officials also estimate that PHMSA will need to provide $6 million annually to states. However, PHMSA officials noted that their estimates may change as they gain additional information about the program. Specifically, after PHMSA begins initial inspections in early 2018, officials will have more information about the time it takes to inspect natural gas storage sites. By the end of fiscal year 2018, they will have even more information with which to develop more precise workload and budget estimates for the program, according to these officials.

To ensure that the states assisting PHMSA are fully qualified to enforce the federal government's minimum safety standards, PHMSA officials have begun developing a state certification program. This has involved drafting certification documents and contacting potential state partners. As of June 2017, PHMSA officials expected all states with intrastate natural gas storage sites to pursue certification. However, officials

[28]According to a workload estimate document prepared by PHMSA officials, PHMSA officials currently inspect 1,439 "inspection units"—collections of assets that an inspector could inspect in 1 week—and PHMSA's new natural gas storage inspections will likely increase its workload by an additional 203 inspection units, bringing the total number of inspection units up to 1,642.

explained that they may not know until the end of fiscal year 2017 exactly how many states will pursue certification. If some states choose not to pursue certification or are not approved by PHMSA, PHMSA will be responsible for inspecting natural gas storage sites in those states, which could increase its inspection workload beyond the level it has estimated. For states that choose certification and are approved, PHMSA plans to use grants to fund up to 80 percent of state inspection costs. However, PHMSA officials told us that PHMSA may not be able to fund states to this level, depending on the approved costs requested by all states and levels of funding PHMSA receives through the appropriations process. In either circumstance, PHMSA's grant program for certified state partners leverages state dollars, since it requires states to fund the portions of their programs not covered by grant funding.

PHMSA Has Established a Strategic Goal but Has Not Yet Followed Certain Leading Practices of Strategic Planning

PHMSA also has established a strategic goal for its natural gas safety enforcement program, but it has not yet followed other leading practices for strategic planning.[29] Specifically, PHMSA officials told us that their new enforcement program will be guided by one of PHMSA's existing strategic goals—to promote continuous improvement in safety performance.[30] PHMSA officials also told us that they are developing a performance goal for their training program and that other performance goals are still being identified and developed. The Government Performance and Results Act of 1993 (GPRA), as amended—which seeks to improve the effectiveness of federal programs by establishing a system for agencies to set goals for program performance and measure results—defines a performance goal as the target level of performance expressed as a tangible, measurable objective against which actual achievement is to be compared.[31] For example, in the area of weather forecasting, we have previously reported that such a goal could be to increase the lead time for predicting tornadoes from 7 to 9 minutes.[32]

[29]Strategic goals constitute a set of policy, programmatic, and management objectives for the programs and operations covered in an agency's strategic plan, and they serve as a framework from which performance goals are derived.

[30]PHMSA's goal to promote continuous improvement in safety performance is one of five strategic goals identified in *PHMSA 2021: Safety – Innovation – Trust*, the agency's strategic framework through 2021. Implementation strategies for meeting these strategic goals can be found in *PHMSA 2021 Business Plan - 2017*.

[31]Pub. L. No. 103-62 (1993).

[32]GAO, *Agencies' Strategic Plans Under GPRA: Key Questions to Facilitate Congressional Review*, GAO/GGD-10.1.16 (Washington, D.C.: May 1997).

PHMSA has not yet followed certain leading practices for strategic planning, as it has not: (1) defined the level of performance or fully addressed core program activities with its existing performance goal; or (2) used baseline data and other data or budget information to inform and refine performance goals.

Defining Level of Performance and Addressing All Core Program Activities

Our prior work has identified several leading practices for strategic planning that PHMSA has not yet followed, such as setting goals that define a certain level of performance and address all core program activities. Some of this prior work has examined requirements under GPRA and the GPRA Modernization Act of 2010.[33] GPRA, which was significantly enhanced by the GPRA Modernization Act of 2010, requires agencies to develop annual performance plans that, among other things, establish performance goals to define the level of performance to be achieved.[34] We have previously reported that requirements under these acts can serve as leading practices for planning at lower levels of the agency.[35] As one of several operating administrations within DOT, PHMSA would be considered a lower level of the agency. In addition, we have found that a key attribute of successful performance measures is that they reflect the full range of core program activities.[36] Moreover, we have found that a key practice for helping federal agencies enhance and sustain collaborative efforts with other agencies is to define and articulate a common outcome or purpose they are seeking to achieve.[37]

While PHMSA has taken some steps to plan strategically for its new program, it has not followed certain leading practices of strategic planning. For example, PHMSA has developed a performance goal for its

[33]Pub. L. No. 103-62 (1993) and Pub. L. No. 111-352 (2011).

[34]Under GPRA, agencies are to prepare performance plans to systematically provide decisionmakers with information on the results to be achieved for a proposed level of resources. These plans are to reinforce the connection between the long-term strategic goals outlined in agencies' strategic plans and the day-to-day activities of their program managers and staff. In so doing, annual performance plans provide a basis for establishing accountability for results.

[35]GAO, *Grants Management: EPA Partially Follows Leading Practices of Strategic Workforce Planning and Could Take Additional Steps*, GAO-17-144 (Washington, D.C.: Jan. 9, 2017).

[36]GAO, *Tax Administration: IRS Needs to Further Refine Its Tax Filing Season Performance Measures*, GAO-03-143 (Washington, D.C.: Nov. 22, 2002).

[37]GAO, *Results-Oriented Government: Practices That Can Help Enhance and Sustain Collaboration among Federal Agencies*, GAO-06-15 (Washington, D.C.: Oct. 21, 2005).

training program, and agency officials told us that they plan to review the number of students who pass their gas storage training course as a measure of the agency's training performance goal. However, with this measure PHMSA has not defined the level of performance to be achieved. An example of a measure of the agency's training performance goal that defines the level of performance could be one that specifies that a certain percentage of students will pass the course on their first attempt. In addition, PHMSA has not yet developed performance goals for other core program activities, such as conducting effective inspections. According to PHMSA subject-matter experts, one of the critical tasks associated with inspecting a gas storage site will be determining whether the operator has met all well monitoring requirements specified in API's Recommended Practice 1171, which addresses the functional integrity of gas storage in depleted hydrocarbon reservoirs and aquifers.[38] An example of a performance goal that could indicate whether PHMSA's inspections are effective could be to annually reduce, by a certain percentage, the number of operators that do not meet the well monitoring requirements of Recommended Practice 1171. Another critical task identified by PHMSA's subject-matter experts will be to determine whether the operator has followed its own risk management plan for gas storage sites—another area where PHMSA has not developed a performance goal. An example of a performance goal in this area could be to annually reduce, by a certain percentage, the number of gas storage operators that have not followed their own risk management plans.

PHMSA officials acknowledged that their performance goals are not yet complete and said that they would strive to refine performance goals as they continue developing the program; however, PHMSA has not yet done so. As they do so, ensuring that their performance goals define the level of performance to be achieved and address core program activities could help them ensure that they effectively track progress toward their strategic goal and make adjustments to activities and resources, if needed, to better meet the goal. In addition, because PHMSA plans to leverage state resources to oversee gas storage sites, the success of its gas storage program will depend, in part, on collaboration with state

[38]The term "functional integrity" refers to the total reliability of the storage system, including the physical integrity of the reservoir and well components as well as the performance reliability assurance established by management systems employed by the storage operator. American Petroleum Institute, *API Recommended Practice 1171*, Chapter 9.

partners. Establishing performance goals for the program could help PHMSA coordinate efforts and resources with the states that are expected to assist PHMSA with inspections.

Using Baseline Data to Inform Performance Goals

Another leading practice of strategic planning involves using baseline and trend data to inform performance goals, according to our prior work.[39] Baseline data—data collected about operations before oversight begins—can serve as a basis for comparison with subsequently collected trend data. We have previously reported that baseline and trend data can provide a context for drawing conclusions about whether performance goals are reasonable and appropriate.[40] For example, we found in 1999 that the Department of Education was able to use such information to gauge the appropriateness of its goals for reducing the default rate on student loans provided through the Federal Family Education Loan program.[41] The program's annual plan provided baseline and trend data for the default rate, which indicated that the rate declined from 22.4 percent to 10.4 percent from fiscal years 1990 to 1995. According to Education's analysis of the data, future declines were likely to be steady but smaller because of the large number of high-default schools that had already been eliminated from the program. For fiscal year 1999, Education set a goal of reducing the default rate to 10.1 percent of borrowers.

For PHMSA's natural gas storage program, PHMSA will have access to baseline data—and eventually trend data—over time that could inform the development of performance goals and subsequent refinement of them. PHMSA officials told us that they have not yet used such data to inform the development of their performance goal because they are still in the process of collecting relevant data. For example, officials told us that, over time, they will have access to data about operators' facilities, functional integrity work, and operations and maintenance procedures

[39]GAO, *Agency Performance Plans: Examples of Practices That Can Improve Usefulness to Decisionmakers*, GAO/GGD/AIMD-99-69 (Washington, D.C.: Feb. 26, 1999).

[40]GAO/GGD/AIMD-99-69.

[41]GAO/GGD/AIMD-99-69.

starting in early 2018.[42] These data will likely include the number of wells that have leaked and been repaired during the last calendar year. As specified in PHMSA's minimum safety standards, PHMSA also plans to collect safety and incident reports to track gas releases, deaths, and injuries resulting in hospitalizations. In addition, in August of 2017, PHMSA officials completed eight industry safety assessments, which involved visiting natural gas storage sites and studying sites' safety procedures. As previously mentioned, these assessments aimed, in part, to document the initial condition of gas storage sites and safety practices. Agency officials told us that they had planned to use the data they collect from these assessments to inform the agency's state certification and inspection programs. They did not specify whether or how they intend to use these data to inform their performance goals. As PHMSA continues developing performance goals for its natural gas storage program, using available data to inform and refine these goals could help the agency ensure that its goals are reasonable and appropriate.

Using Budgetary Information to Inform Performance Goals

We also have reported that comparing information about budgetary resources with information about performance goals can help decisionmakers determine whether their performance goals are achievable. Specifically, we have reported that decisionmakers can better compare planned levels of accomplishment with the resources requested if they have information about how funding levels are expected to achieve a discrete set of performance goals.[43] For example, we reported in a best practices report about strategic planning that the Internal Revenue Service (IRS) included in its performance plan for 1999 the budget amounts that corresponded with past performance levels. Table 2 illustrates how IRS used this information to inform proposed performance levels for the upcoming year. Moreover, GPRA requires agencies to prepare an annual performance plan covering each program activity set forth in the budget and, among other things, describe the resources required to meet performance goals. As previously mentioned, we have found that GPRA requirements can serve as leading practices for planning at lower levels of the agency.

[42]PHMSA officials noted that they do not expect operators to produce comprehensive integrity assessments or fully estimate safety risks at their natural gas storage sites in 2018. Instead, PHMSA officials stated that they expect operators will complete these integrity assessments and take preventative and mitigative measures in 3 to 8 years. PHMSA will require operators to submit these data annually through PHMSA Form 7100.4-1.

[43]GAO/GGD/AIMD-99-69.

Table 2: Excerpt From the Department of the Treasury's Fiscal Year 1999 Annual Performance Plan Featuring the Internal Revenue Service

Performance Plans for FY 1999 and FY 1998, and Performance Report for FY 1997 Data						
	FY 1995[a]	FY 1996[a]	FY 1997[a]		FY 1998	FY 1999
	Actual	Actual	Plan	Actual	Final Plan	Proposal
Budget Authority ($000s)	$814, 128	$780,512	$788, 138	$794,950	$850,787	$888,408
Direct FTE	21,307	20,460	15,481	13,396	15,105	15,113
Performance Plan						
A. Performance Goal: Improve Customer Service						
Performance Measure(s):						
1. Total Number of Individual Refunds Issued (millions)[b]	88.7	85.5	84.6	87.9	89.6	93.3
2. Refund Timeliness—Paper (days)	36	38	40	38	40	40
3. Refund Timeliness—Electronic Filing (days)	21	15.5	21	14.5	21	21
4. Processing Accuracy Rate—Paper Filing	95%	95%	95%	95.2%	95%	95%
5. Processing Accuracy Rate—Electronic Filing	99%	99%	99%	99.3%	99%	99%
6. Notice Accuracy	98.2%	98.1%	N/A	98.6%	98.5%	98.5%
7. Number of Telefile Returns (millions)	0.7	2.8	N/A	4.7	5.5	5.9
B. Performance Goal: Increase Compliance						
Performance Measure(s):						
8. Number of Primary Returns Processed (millions)[b]	193.15	196.2	197.9	202.6	208.4	211.8
C. Performance Goal: Increased Productivity						
Performance Measure(s):						
9. Percent of Individual Returns Filed Electronically	8.0%	10.2%	13.0%	15.9%	17.0%	19.5%
10. Percent of Dollars Received Electronically			24.7%	40.6%	48.4%	78.2%
11. Percent of Dollars Received via Third Party Processors (Lockbox)[c]			65.3%	70.9%	70.9%	70.9%

Source: Department of the Treasury Fiscal Year 1999 Performance Plan. | GAO-18-89

[a]IRS originally reported that Service Center Adjustments moved to the Customer Service activity as part of a restructure in fiscal year 1998. As a result, fiscal year 1997 has been restructured to mirror the fiscal year 1998 structure; fiscal years 1995 and 1996 are in the old budget structure.

[b]IRS originally reported that this is not a measure, but a projection for budget purposes, and was not used in the business review.

[c]IRS originally reported that no additional payments were planned to migrate to Lockbox.

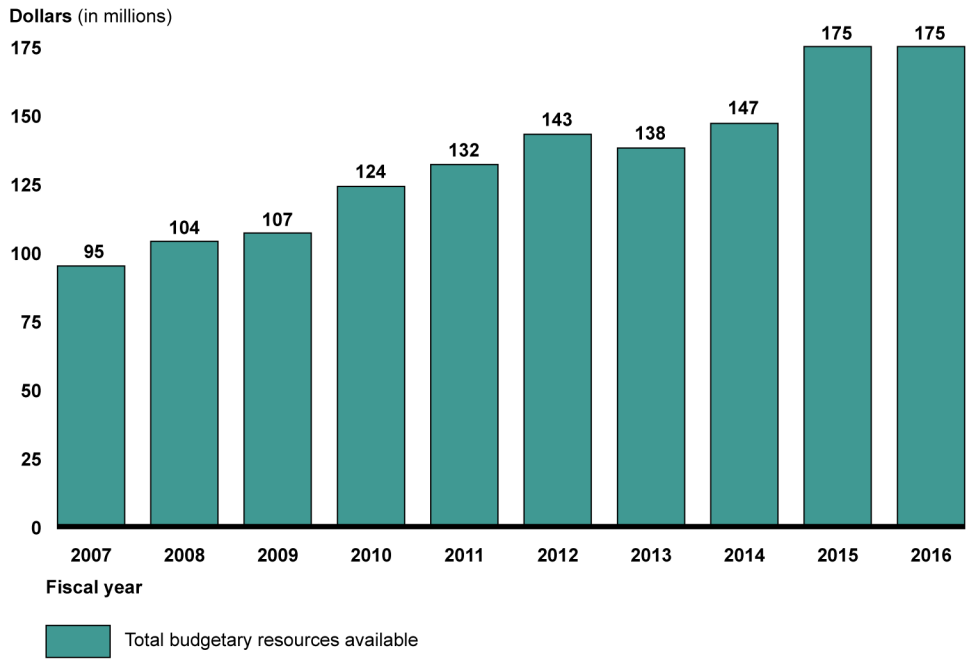
Assessing whether the new program's performance goals are achievable given budgetary resources is important at a time when PHMSA officials are managing other new resources and responsibilities. For example, in addition to requiring DOT to establish minimum safety standards for

natural gas storage sites, the PIPES Act of 2016 also requires DOT to update minimum safety standards for small-scale liquefied natural gas pipeline facilities. To carry out its responsibilities, PHMSA has received additional resources in recent years. As shown in figure 3, PHMSA's Pipeline Safety Program has seen its total budgetary resources available increase from about $95 million in fiscal year 2007 to about $175 million in fiscal year 2016.[44] In addition, the Consolidated Appropriations Act for fiscal year 2017 included a provision allowing for the obligation of up to $8 million from fees collected in fiscal year 2017 from operators for PHMSA's natural gas storage program.[45] These fees will be deposited in an Underground Natural Gas Storage Facility Safety account within PHMSA's Pipeline Safety Fund and will be added to the Pipeline Safety Program's total budgetary resources available for fiscal year 2017.

[44]Budgetary resources available for obligation may include an agency's new budget authority and unobligated balances brought forward from the prior year. Budgetary resources available for obligation may also include fees collected to offset expenses. Budget authority is the authority provided by federal law to enter into financial obligations that will result in immediate or future outlays involving federal government funds.

[45]Pub. L. No. 115-31 (2017).

Figure 3: Total Budgetary Resources Available for the Pipeline and Hazardous Materials Safety Administration's (PHMSA) Pipeline Safety Program, Fiscal Years 2007–2016



Source: GAO analysis of data from Office of Management and Budget's (OMB) OMB Max data system. | GAO-18-89

Note: Budgetary resources available for obligation may include an agency's new budget authority and unobligated balances brought forward from the prior year. Budgetary resources available for obligation may also include fees collected to offset expenses. Budget authority is the authority provided by federal law to enter into financial obligations that will result in immediate or future outlays involving federal government funds. PHMSA's Office of Pipeline Safety is responsible for the agency's natural gas storage safety program and other activities. This figure does not reflect funding for natural gas storage inspections, as these activities were not funded until fiscal year 2017.

PHMSA is not yet in a position to use budget information to inform or refine performance goals for its natural gas storage program because PHMSA officials are still developing these goals and PHMSA lacks key data, such as data on the time it takes—and therefore the budgetary resources required—to inspect natural gas storage sites. As previously mentioned, PHMSA will begin inspections in early 2018, and officials will have a better understanding of how long it takes to inspect natural gas storage sites by the end of fiscal year 2018. As PHMSA officials continue developing performance goals and finish collecting relevant data, using information about budgetary resources to inform and refine these goals may help PHMSA ensure that its goals are achievable.

Conclusions

Natural gas storage sites are key elements of our nation's energy system, helping ensure that natural gas is available when demand peaks. As evidenced by the large-scale leak of natural gas outside Los Angeles that started in 2015 and extended into 2016, leaks from these sites can cause economic disruptions and environmental damage. These sites recently became subject to national safety standards, which are subject to further revision.

PHMSA has taken a variety of steps to meet its new responsibilities for overseeing natural gas storage sites, such as developing a training program for inspectors and a performance goal for training. However, PHMSA has not yet followed certain leading practices of strategic planning in starting PHMSA's new safety enforcement program. For example, PHMSA's only current performance goal does not define the level of performance officials are working to achieve, and PHMSA does not currently have goals that address other core program activities, such as conducting effective inspections. PHMSA also has not yet used the baseline data it is collecting to develop its performance goals. PHMSA officials explained that they are still developing performance goals for their new program and collecting data. As the agency continues to develop these goals, ensuring that performance goals define the level of performance and address all core program activities could help the agency better track progress toward its strategic goal and adjust activities and resources, if needed, to better meet the goal. Using baseline data to develop these goals could help PHMSA ensure that its goals are reasonable and appropriate. Finally, once PHMSA finalizes performance goals for the program and collects relevant data over time as well as budgetary information, using these data and information when available to inform and refine performance goals may help PHMSA ensure that its goals are achievable.

Recommendations for Executive Action

We are making the following two recommendations to PHMSA.

The Administrator of PHMSA should ensure that PHMSA defines levels of performance, addresses core program activities, and uses baseline data as it continues developing performance goals for its natural gas storage program. (Recommendation 1)

The Administrator of PHMSA should ensure that PHMSA uses other data and information about budgetary resources as they become available to inform and refine its performance goals. (Recommendation 2)

Agency Comments

We provided a draft of this report to DOT for review and comment. In written comments, DOT concurred with the report's recommendations and provided additional information on steps they are taking or plan to take as part of their oversight of natural gas storage sites. In addition, DOT stated that it would provide a detailed response to each recommendation within 60 days of our final report's issuance. The complete comment letter is reproduced in appendix III.

As agreed with your offices, unless you publicly announce the contents of this report earlier, we plan no further distribution until 30 days from the report date. At that time, we will send copies of this report to the appropriate congressional committees, the Secretary of Transportation, and other interested parties. In addition, the report will be available at no charge on the GAO website at http://www.gao.gov.

If you or members of your staff have any questions about this report, please contact us at (202) 512-3841, gomezj@gao.gov, or ruscof@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix IV.

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Director, Natural Resources and Environment

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Director, Natural Resources and Environment

List of Requesters

The Honorable Eddie Bernice Johnson
Ranking Member
Committee on Science, Space, and Technology
House of Representatives

The Honorable Suzanne Bonamici
Ranking Member
Subcommittee on Environment
Committee on Science, Space, and Technology
House of Representatives

The Honorable Don Beyer
Ranking Member
Subcommittee on Oversight
Committee on Science, Space, and Technology
House of Representatives

The Honorable Marc Veasey
Ranking Member
Subcommittee on Energy
Committee on Science, Space, and Technology
House of Representatives

Appendix I: Objectives, Scope, and Methodology

In this report, we examine (1) the status of the Pipeline and Hazardous Materials Administration's (PHMSA) efforts to implement the requirement under the Protecting Our Infrastructure of Pipelines and Enhancing Safety (PIPES) Act of 2016 to issue minimum safety standards for natural gas storage sites, [1] and (2) the extent to which PHMSA has planned strategically to enforce its safety standards for natural gas storage sites.

To examine the status of PHMSA's efforts to implement the requirement to issue minimum safety standards for natural gas storage sites, we examined laws, regulations, and agency documents that describe the authority, time frames, and enforcement goals for implementing new federal rules under the PIPES Act. Specifically, we reviewed the PIPES Act to identify requirements that the act directed to the Department of Transportation (DOT), or PHMSA. To understand PHMSA's implementation of DOT's requirements under the act, we reviewed PHMSA notices and regulations as presented in the *Federal Register* and discussed the information in these documents with agency officials. We also reviewed guidance documents on the PHMSA website intended to provide natural gas storage operators with more detailed guidance and discussed the documents with agency officials. We reviewed an October 2016 report, mandated by the act, which was issued by a task force led by the Department of Energy (DOE). We also obtained and reviewed copies of recommended practices issued by the American Petroleum Institute (API), which issues industry consensus standards for the oil and gas industry, and interviewed API officials to better understand these recommended practices.

We also interviewed agency officials. Specifically, we interviewed officials with PHMSA, the Federal Energy Regulatory Commission, the Bureau of Land Management within the Department of the Interior, and the Environmental Protection Agency, to understand how they participated in the task force and to what degree they have responsibilities related to natural gas storage safety enforcement.

In addition, we obtained data from PHMSA and DOE's Energy Information Administration about natural gas storage sites to gain an estimate of the number and regulatory status of various natural gas storage sites, their locations, and other details. We assessed the reliability of these data by (1) corroborating these data with other sources,

[1]Pub. L. No. 114-183 (2016).

(2) reviewing existing information about the data and the system that produced them, and (3) interviewing agency officials knowledgeable about the data. We determined that these data were sufficiently reliable for the purposes of this report. We also interviewed agency officials at DOT and PHMSA, including discussing agency requirements under the PIPES Act and how PHMSA planned to implement its responsibilities. To better understand the operation and control of natural gas storage sites, we conducted a site visit to the Aliso Canyon Gas Storage Facility in California and spoke to officials representing the operator of the site, and state government officials responsible for safety enforcement at the site.

To examine the extent to which PHMSA has planned strategically to enforce safety standards for natural gas storage sites, we compared information we gathered from PHMSA officials and documents with leading practices for strategic planning identified by our prior work, which were identified by examining requirements under the Government Performance and Results Act (GPRA) of 1993.[2] We have previously reported that requirements under GPRA and the GPRA Modernization Act of 2010 can serve as leading practices for planning at lower levels of the agency.[3] We also interviewed PHMSA officials—including budgetary, policy, and programmatic officials—about their planning efforts for the natural gas storage program. In addition, we reviewed regulations and documents that reflect agency planning efforts, including: PHMSA's interim final rule on the safety of underground natural gas storage facilities; agency guidance, such as frequently asked questions for operators of natural gas storage sites;[4] and agency planning documents, such as the *Training Implementation Plan for Natural Gas Underground Storage Regulation Training*,[5] *PHMSA 2021 Business Plan - 2017*,[6] and

[2]Pub. L. No. 103-62 (1993).

[3]GAO, *Grants Management: EPA Partially Follows Leading Practices of Strategic Workforce Planning and Could Take Additional Steps*, GAO-17-144 (Washington, D.C.: Jan. 9, 2017) and Pub. L. No. 111-352 (2011).

[4]Pipeline and Hazardous Materials Safety Administration, *Pipeline Technical Resources: Underground Natural Gas Storage: FAQs*, accessed August 1, 2017, https://primis.phmsa.dot.gov/ung/faqs.htm.

[5]Pipeline and Hazardous Materials Administration, *Training Implementation Plan for Natural Gas Underground Storage Regulation Training* (Mar. 31, 2017).

[6]Pipeline and Hazardous Materials Administration, *PHMSA 2021 Business Plan - 2017*.

workload and budget estimates for the program.[7] Using information obtained from these sources about PHMSA's efforts to plan for its natural gas storage program, we compared PHMSA's planning efforts with leading practices for strategic planning identified in our prior reports.[8]

We conducted this performance audit from November 2016 to November 2017 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

[7]Pipeline and Hazardous Materials Administration, *Underground Natural Gas Storage Facilities Budget Estimates* and untitled workload estimate document.

[8]GAO, *Agency Performance Plans: Examples of Practices That Can Improve Usefulness to Decisionmakers*, GGD/AIMD-99-69 (Washington, D.C.: Feb. 26, 1999).

Appendix II: Number of Active Natural Gas Storage Sites as of January 2016 by State and Jurisdiction

Table 3 identifies the 415 natural gas storage sites active as of January 2016, by state and jurisdiction. The number of natural gas storage sites that fall under federal or state jurisdiction in each state is presented, along with the total storage capacity of the sites. A natural gas storage site is considered to be under federal jurisdiction—also known as "interstate"—if the site is linked to a federally-regulated interstate pipeline permitted by the Federal Energy Regulatory Commission. Otherwise, sites are under state jurisdiction.

The sites represented in this table were compiled by the Department of Energy's Energy Information Administration in 2016, and provided by the Department of Transportation's Pipeline and Hazardous Materials Safety Administration (PHMSA). EIA collects these data using a survey of natural gas storage site operators. According to a PHMSA document, PHMSA used these data to, among other things, identify natural gas storage sites and calculate the amount of user fees that it charged operators in 2017 (the first year PHMSA collected these user fees) to fund its inspection and enforcement programs. PHMSA plans to update its information about natural gas storage sites using data submitted by operators, as required by its interim final rule.[1] This rule requires natural gas storage site operators to submit these data on or before July 18, 2017. PHMSA plans to require operators to annually submit this information using a form. According to PHMSA officials, the Office of Management and Budget recently approved this form. As a result, PHMSA will begin collecting data that reflect calendar year 2017 by its due date of March 15, 2018. PHMSA officials told us that it will take about 5 to 6 months to develop a website that will allow PHMSA to efficiently collect these data from operators for all sites this year and in future years.

[1]U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration, *Interim Final Rule: Pipeline Safety: Safety of Underground Natural Gas Storage Facilities*, 81 Fed. Reg. 91,860 (Dec. 19, 2016) (codified at 49 C.F.R. parts 191 and 192).

Table 3: Number of Active Natural Gas Storage Sites, by State and Jurisdiction, as of January 2016

State	Pre-PIPES Act jurisdiction (federal or state)	Gas storage capacity (billion cubic feet)	Number of sites
Alaska	federal	[a]	[a]
	state	67.9	5
Alabama	federal	11.2	1
	state	22.0	1
Arkansas	federal	[a]	[a]
	state	12.2	2
California	federal	[a]	[a]
	state	375.5	14
Colorado	federal	52.1	6
	state	11.7	4
Iowa	federal	90.3	4
	state	[a]	[a]
Illinois	federal	89.9	6
	state	213.7	22
Indiana	federal	5.0	4
	state	28.6	17
Kansas	federal	116.7	11
	state	6.3	6
Kentucky	federal	79.3	5
	state	28.3	18
Louisiana	federal	411.7	12
	state	42.2	7
Maryland	federal	18.3	1
	state	[a]	[a]
Michigan	federal	282.5	17
	state	403.2	27
Minnesota	federal	[a]	[a]
	state	2.0	1
Mississippi	federal	170.2	9
	state	32.8	3
Missouri	federal	[a]	[a]
	state	6.0	1

State	Pre-PIPES Act jurisdiction (federal or state)	Gas storage capacity (billion cubic feet)	Number of sites
Montana	federal	164.4	1
	state	33.1	4
Nebraska	federal	12.7	1
	state	[a]	[a]
New Mexico	federal	44.0	1
	state	15.7	1
New York	federal	123.4	24
	state	3.5	2
Ohio	federal	166.4	17
	state	64.4	7
Oklahoma	federal	103.7	5
	state	87.7	8
Oregon	federal	[a]	[a]
	state	15.9	7
Pennsylvania	federal	411.6	39
	state	18.2	10
Tennessee	federal	[a]	[a]
	state	1.8	2
Texas	federal	146.4	3
	state	388.2	33
Utah	federal	54.9	3
	state	[a]	[a]
Virginia	federal	4.0	1
	state	1.4	1
Washington	federal	24.6	1
	state	[a]	[a]
West Virginia	federal	253.3	27
	state	6.0	4
Wyoming	federal	68.8	5
	state	4.9	4
Subtotal of sites by jurisdiction	**federal**	**2,905.5**	**204**
	state	**1,893.1**	**211**
Total		**4,798.7**	**415**

Source: Energy Information Administration and Pipeline and Hazardous Materials Safety Administration. | GAO-18-89

Note: A natural gas storage site is considered to be under federal jurisdiction—also known as "interstate"—if the site is linked to a federally-regulated interstate pipeline permitted by the Federal Energy Regulatory Commission; otherwise it is under state jurisdiction. Gas storage capacity refers to

"working gas capacity," which the Energy Information Administration defines as the capacity of the volume of gas in the storage site that can be injected and withdrawn and is available to the marketplace. Gas storage capacity is displayed in billion cubic feet. For context, the United States uses about 26,600 billion cubic feet per year.

[a]Indicates no natural gas storage site is present.

Appendix III: Comments from the Department of Transportation

U.S. Department of Transportation
Office of the Secretary of Transportation

Assistant Secretary for Administration

1200 New Jersey Avenue, SE
Washington, DC 20590

OCT 30 2017

J. Alfredo Gomez
Director, Natural Resources and Environment
U.S. Government Accountability Office (GAO)
441 G Street NW
Washington, DC 20548

Dear Mr. Gomez:

The Pipeline and Hazardous Materials Safety Administration (PHMSA) is committed to protecting people and the environment by advancing the safe transportation of energy and other hazardous materials that are essential to our daily lives. The Protecting our Infrastructure of Pipelines and Enhancing Safety Act of 2016 required PHMSA to issue minimum safety standards for underground natural gas facilities. Underground natural gas storage facilities include depleted hydrocarbon reservoirs, aquifer reservoirs, and solution-mined salt cavern reservoirs—commonly known as underground natural gas storage. As of October 2016, there are 415 active underground natural gas storage fields scattered across 31 States and split almost evenly between interstate and intrastate facilities.

PHMSA is aggressively pursuing implementation of our new underground storage program, including establishing a regulatory framework, training State and Federal inspectors, developing State partnerships, and establishing data collection requirements. Specific actions taken and underway include the following:

- Published an Interim Final Rule (IFR) titled, "Pipeline Safety: Safety of Underground Natural Gas Storage Facilities" that took effect on January 19, 2016. The IFR revises the Federal pipeline safety regulations to address critical safety issues related to downhole facilities, including wells, wellbore tubing, and casing, at underground natural gas storage facilities. PHMSA is currently addressing comments on the IFR;
- Developing a curriculum to train Federal and State partners to inspect underground storage facilities;
- Identifying inspection criteria for policies, procedures, and records, for operating and maintenance practices;
- Assessing industry alignment with the new regulations by touring a cross-section of facilities; and
- Conducting a risk-ranking of the more than 400 interstate and intrastate underground natural gas storage facilities currently in operation throughout the United States.

Upon review of the draft report, we concur with both recommendations to (1) define levels of performance, address core program activities, and use baseline data as we continue developing performance goals for our natural gas storage program; and (2) use other data and information about budgetary resources as they become available to inform and refine our performance goals. The Department will provide a detailed response to each recommendation within 60 days of the final report's issuance.

We appreciate the opportunity to respond to the GAO draft report. Please contact Madeline M. Chulumovich, Director of Audit Relations and Program Improvement, at (202) 366-6512, with any questions or if GAO would like to obtain additional details.

Sincerely,

Keith Nelson
Assistant Secretary for Administration

Appendix IV: GAO Contacts and Staff Acknowledgments

GAO Contacts

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Staff Acknowledgments

In addition to the individuals named above, Mike Hix and Jon Ludwigson (Assistant Directors), Richard Burkard, Lee Carroll, Nirmal Chaudhary, Ellen Fried, Cindy Gilbert, Carol Henn, Mary Koenen, Jessica Lemke, Ben Licht, Greg Marchand, John Mingus, Katrina Pekar-Carpenter, Sara Sullivan, and Kiki Theodoropoulos made important contributions to this report.