

North America

Fossil Fuels | Natural Gas

California Addresses Gas Shortage Risks Following Aliso Canyon Leak

Incident Likely to Lead to Tightened Gas Storage Regulations Nationwide

April 18, 2016

Policy Brief

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Key Takeaways:

- California has outlined mitigation measures to preserve gas and electric reliability following the four-month leak at the Aliso Canyon underground natural gas storage facility
- State agencies estimate that limited current operations could lead to electricity service interruptions in the upcoming summer
- The Department of Energy and Pipeline and Hazardous Materials Safety Administration have announced an interagency task force to support safe operations of natural storage facilities and assess potential reliability risks from loss of storage capacity
- National attention could bolster the administration's efforts to curb methane emissions and expedite PHMSA rulemaking on underground storage, prompting other states to reevaluate their storage regulations

Entities Mentioned:

- California Independent System Operator
- California Public Utilities Commission
- Department of Energy
- Pipeline and Hazardous Materials Safety Administration

Related Research

[PHMSA Proposes Revisions to Expand Scope of Natural Gas Pipeline Safety Regulations](#)

[California Leak Exposes Risks Of Increasing Reliance On Natural Gas](#)

Insight for Industry – Natural Gas Storage Regulations Draw National Attention as California Seeks to Address Reliability Issues Stemming from Aliso Canyon Leak

On April 5, 2016, the California Public Utilities Commission (CA PUC), California Energy Commission (CEC), California Independent System Operator (CA ISO), and Los Angeles Department of Water and Power (LADWP) released an action plan identifying measures to preserve gas and electric reliability in the greater Los Angeles area following a major leak at the Aliso Canyon underground natural gas storage facility. A technical assessment by the four agencies found that the facility's currently limited operations present a distinct possibility of electricity service interruptions in the upcoming summer and price spikes next winter if Aliso Canyon does not resume its normal operations.

The operator of the facility, Southern California Gas (SoCalGas), is prohibited from injecting natural gas into the underground reservoir until a comprehensive safety review of the facility is completed. The leak, detected in October 2015, is attributed to the failure of a 40-year-old pipe more than a thousand feet underground, allowing pressurized gas to escape into the atmosphere. By February 18, when state regulators confirmed having finally sealed the leaking storage well, the total leakage had reached 5.4 billion cubic feet of gas, according to the California Air Resources Board (CARB).

The multi-agency plan is expected to reduce the possibility of electric interruptions, although it will not completely eliminate the risk. The plan prioritizes the need to maintain inventory at 15 Bcf through the end of winter and into summer. Among other measures, the plan recommends tighter gas balancing rules, increased gas-electric coordination, conservation measures, and possible deferral of gas maintenance tasks.

Given the role of natural gas storage in the shift towards renewables, the incident has exposed not only the shortcomings in California's regulatory oversight but, quite possibly, inadequate control of approximately 400 U.S. underground storage facilities. Except for storage serving interstate commerce, which is subject to the Federal Energy Regulatory Commission's (FERC) jurisdiction, most facilities are state-regulated.

The California incident has attracted national attention to the issue, with the Department of Energy (DOE) and the Department of Transportation's Pipeline and Hazardous Materials Safety Administration (PHMSA) announcing an interagency task force to support the development of best practices for well integrity and proper response plans, safe operations of storage facilities, and potential reliability risks from loss of storage capacity. The leak has also alerted other states as evident from recent utility commission proceedings in Iowa and Michigan referring to the incident, with regard to imminent change in supply patterns and demands, public awareness of methane emissions, and the federal government's role in regulating underground storage. This national attention will likely bolster PHMSA's plans to curb methane emissions and further regulate underground storage.

The multi-agency plan is expected to reduce, although not eliminate, the possibility of electric interruptions

Action Plan Suggests Immediate Measures to Resolve Upcoming Gas Shortage Risks

The California Action Plan aims to reduce the risks of gas curtailments in the upcoming summer from limited operations of the Aliso Canyon facility. Currently, the facility has 15 billion cubic feet (Bcf) of natural gas preserved for use during periods of peak demand to avoid energy interruptions. However, the California agencies' technical assessment found that in the absence of Aliso Canyon supplies, the region could face up to 14 days of gas shortages for electrical power plants this summer, with the potential to interrupt electrical service to utility customers. The assessment attributed potential curtailments to differences between gas scheduled and received into the SoCalGas system and actual customer demand, planned maintenance work, and unplanned outages.

The plan prioritizes the need to maintain inventory at 15 Bcf through the end of winter and into summer, withdrawing only to augment pipeline supply coming into the SoCalGas system during critical periods. In addition, using the facility's remaining gas this summer could increase the risk of shortages next winter, absent timely restoration of normal operations to store new gas for winter use. Currently, SoCalGas is prohibited from injecting natural gas into the Aliso Canyon facility until all 114 wells have either passed tests or been taken out of service and isolated from the underground reservoir. The plan also envisions bringing a small group of wells that have passed the inspection back into service, so that a limited capacity returns to service sooner than if all wells were inspected.

To maximize operational flexibility, the plan recommends that LADWP curtail physical gas hedging, halt economy dispatch sales of energy to other market participants, and forgo block energy and forward capacity sales, thereby retaining the flexibility to reduce generation when gas use must be curtailed. The action plan also recommends conservation measures including the Flex Alert program – which encourages consumers to reduce electricity usage – until Aliso Canyon is fully available. Finally, the plan recommends expanding gas and electricity efficiency and demand response programs, and reprioritizes investment in the existing solar thermal program.

Near-term mitigation measures are grouped into five categories to improve the reliability for summer 2016 (Table 1). California agencies will hold another workshop focused on the 2016-2017 winter assessment and action plan in late summer or early fall.

In the absence of Aliso Canyon supplies, the region could face up to 14 days of gas shortages for electrical power plants this summer, with the potential to interrupt electrical service to utility customers

Table 1 – List of Mitigation Measures Outlined in the Aliso Canyon Reliability Action Plan

| Category | Mitigation Measures |
|---|---|
| Prudent Aliso Canyon use | Utilize the 15 Bcf currently stored at Aliso Canyon to prevent summer electricity interruptions |
| | Efficiently complete the required safety review at Aliso Canyon to allow safe use of the field |
| Tariff changes | Implement tighter gas balancing rules |
| | Modify operational flow order rule |
| | Provide market information to generators before cycle 1 gas scheduling |
| | Require California ISO generators to show gas lined up before bid into day-ahead electricity market |
| Operational coordination | Increase electric and gas operational coordination |
| | Establish more specific gas allocation among electric generators in advance of curtailment |
| | Determine if any gas maintenance tasks can be safely deferred |
| LADWP | Curtail physical gas hedging |
| | Stop economic dispatch |
| | Curtail block energy and capacity sales |
| Reduce natural gas and electricity use | Use new and existing programs asking customers to reduce natural gas and electricity energy consumption |
| | Expand gas and electric efficiency programs targeted at low income customers |
| | Expand demand response programs that target air conditioning and large commercial use |
| | Focus and reprioritize existing energy efficiency towards projects with potential to impact usage this summer and coming winter |
| | Reprioritize spending in existing solar thermal program to fund projects installable this summer and by end of 2017 |

Source: CAISO

Aliso Canyon Critical to Ensure Reliable Supply to Power Plants and Refiners

Natural gas-fired generation has become the dominant source of electricity in California and fuels approximately 43 percent of electricity consumption. Since the closure of the San Onofre Nuclear Generation Station (SONGS) units in 2013, natural gas demand on the SoCalGas system has risen significantly, and ample natural gas storage inventory levels together with interstate pipeline capacity have so far helped meet additional demand without reliability issues.

Aliso Canyon’s 86 Bcf storage capacity is critical to both meeting peak gas usage demands in winter months and helping meet peak electrical demands during the summer months. As winter demand can exceed the 3.875 Bcf/day capacity that SoCalGas’ high-pressure gas pipelines can accept, storage is essential. The facility also provides gas supplies to natural gas-fired power plants that are critical to meet regional electrical demand. Currently, there are

17 major gas-fired electric plants in the Los Angeles Basin with a combined capacity of 9,838 MW. Although the entire capacity does not operate daily, most of it operates on hot days to meet high electricity demand for cooling needs. During these times, SoCalGas relies on Aliso Canyon to meet the hourly change in gas requirements as these generators operate during peak hours and may need to be available to produce quickly, in the event of outages.

The action plan also notes that Aliso Canyon is on the lower pressure local transmission system, meaning that gas that comes into the Los Angeles Basin cannot overcome the higher pressure of the backbone transmission system to leave the basin. When SoCalGas' system is met with insufficient supply, SoCalGas allows the flowing supply to meet demand on the backbone system and withdraws from Aliso Canyon to meet demand in the basin. Compared to SoCalGas' other fields, Aliso Canyon is the only field capable of supporting hourly operating changes within the Los Angeles Basin. Among the other facilities, Play del Rey is small in size, Honor Rancho is several hours of flow farther away, and La Goleta is too far and only marginally connected to the Los Angeles loop. Therefore, Aliso Canyon is considered essential to the overall reliability of both the gas and electrical systems.

The balancing provisions of SoCalGas have been beneficial for noncore customers – large industrial and commercial consumers, electric generators, and oil refineries that procure their own natural gas supplies, but which use SoCalGas' transmission and distribution system to transport their supply elsewhere. In such a market structure involving many entities that need to communicate and confirm operations in the supply chain, SoCalGas allows noncore customers to balance their demand and delivery on a monthly basis within a tolerance band of plus or minus 10 percent, rather than requiring daily balancing. This flexibility has been made possible by the large amount of gas storage available.

The storage capacity is also of particular importance as California adds more renewables which depend on natural gas-fired generators to ramp up and down more frequently. The need for more peaker generation plants remains a key driver for natural gas demand as California has been striving to meet its goal of procuring 50 percent of electricity from renewable sources by 2030.

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Opposing Groups Claim that State Assessments Fail to Demonstrate Need for Aliso Canyon Operations for Reliability

Consumer activist groups, including Consumer Watchdog and Food & Water Watch, have opposed the findings in the multi-agency technical assessment and reliability plan, saying that the conclusions rely on inflated estimates for electricity demand and underestimate of the capacity of other SoCalGas gas storage facilities. A report commissioned by Food & Water Watch says that the state agencies' assessments make incorrect statements regarding the ability of SoCalGas' Honor Rancho storage field, which is 10 miles from Aliso Canyon and on the same Los Angeles pipeline loop, to serve as an effective alternative for Aliso Canyon to ensure reliability. The report noted that SoCalGas' three

additional natural gas storage fields (Honor Rancho, La Goleta, and Playa del Rey) collectively store 50 Bcf of natural gas and can supply up to 1.8 Bcf per day, complementing the 3.875 Bcf per day of firm pipeline capacity held by SoCalGas to assure supplies to core customers. It also noted that the agencies did not recognize that non-core customers can use firm capacity contracts to reduce dependence on storage. The report pointed to neighboring Arizona and Nevada – which depend heavily on natural gas-fired generation – have fewer interstate pipelines and no in-state storage facilities, and rely on firm delivery contracts to assure reliable natural gas supply to core customers and electric generators.

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California Leak Triggers Alerts other State and Federal Regulators on Natural Gas Safety

Several months after the leak, multiple agencies in California and beyond have engaged in parallel actions focused on the immediate mitigation measures. On January 6, Governor Brown issued an emergency order prohibiting injection into Aliso Canyon until the completion of a comprehensive review of the safety of the storage wells and the surrounding air quality. The Department of Conservation, Division of Oil, Gas, and Geothermal Resources (DOGGR) and independent experts have developed a set of tests that wells will have to undergo before injection is allowed to begin again. DOGGR has also issued emergency regulations to address immediate safety issues at underground storage facilities in the state and is also developing permanent rules.

Several bills have been introduced in California to address the safety of Aliso Canyon specifically and underground gas storage projects more generally (Table 2).

Table 2 - Natural Gas Storage Bills Introduced in California after the Aliso Canyon Incident

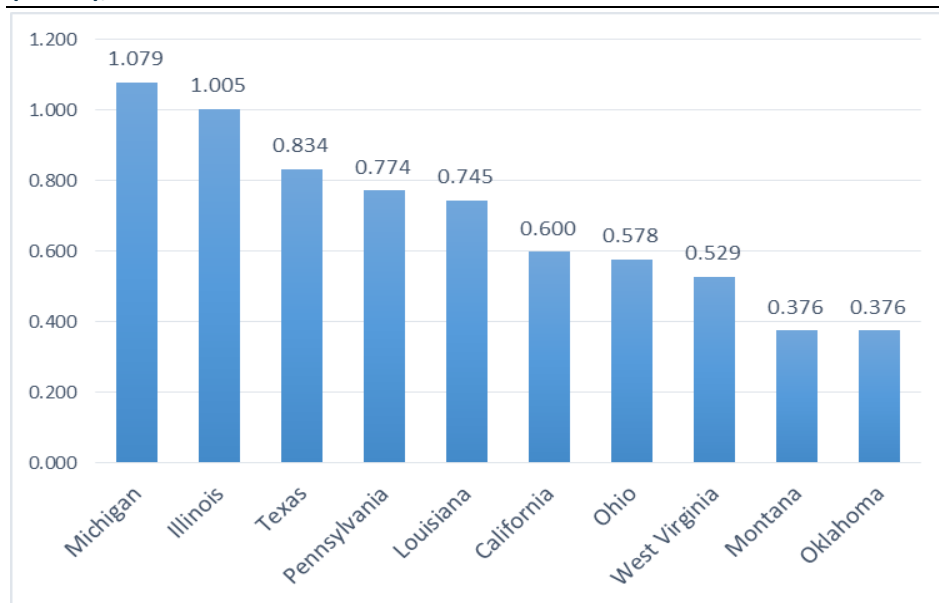
| Bill Number | Date of Last Action/Status | Description |
|-------------|------------------------------|---|
| AB 1905 | April 7, 2016 Introduced | Would require an independent scientific study on natural gas injection and storage practices and facilities before July 1, 2017 and declare that it should take effect immediately as an urgency statute. |
| AB 1903 | April 5, 2016 Introduced | Would require a study by the Office of Environmental Health Hazard Assessment of the long-term health impacts of the significant natural gas leak from the Aliso Canyon facility, as well as publish and transmit the report and ongoing findings to the appropriate policy committees of the Legislature on a biennial basis, on or before January 1 of every even-numbered year, from 2018 until 2028; would require SoCalGas to pay for the study and prohibit the company from recovering any of those costs. |
| AB 1902 | April 5, 2016 Introduced | Would establish a three-year statute of limitations to commence a civil action for injury, illness, or wrongful death based on exposure to methane, benzene, methanethiol, or any other hazardous material or toxic substance resulting from the Aliso Canyon gas leak |
| AB 2748 | March 30, 2016 Introduced | Would create a right of action against SoCalGas for any person owning real property in the Porter Ranch area on October 23, 2015, who suffers a diminution in value of that real property resulting from the leakage of natural gas from the Aliso Canyon Gas Storage Facility during 2015 and 2016; would specify a mechanism for measuring the diminution in value. |

| Bill Number | Date of Last Action/Status | Description |
|---------------|--------------------------------------|---|
| SB 380 | March 30, 2016 Passed One Chamber | Would continue the prohibition of SoCalGas injecting natural gas into the Aliso Canyon facility located until the completion of comprehensive review of the safety of the gas storage wells and determination that well integrity has been ensured and risks of failures identified in the review have been addressed; would require determination of criteria for the safety review with input from independent experts. |
| SB 887 | March 29, 2016 Introduced | Would require DOGGR, before January 1, 2018, and annually thereafter, to inspect all natural gas storage wells serving or located in a natural gas storage facility and would prescribe standards for a natural gas storage well, and would bring storage wells in existence on December 31, 2016 into compliance. |

Source: EnerKnol

The Aliso Canyon incident has also alerted other states on natural gas storage issues. For example, a January hearing before the Iowa Utilities Board regarding a pipeline permit discussed the Aliso Canyon issue with regard to imminent change in supply patterns and demands, as well as public awareness of methane emissions. Similarly, a March proceeding on gas cost recovery before the Michigan Public Service Commission pointed to the Aliso Canyon incident in discussing the role for the federal government in regulating underground storage. Only Michigan, Illinois, Texas, Pennsylvania, and Louisiana have more underground natural gas storage than California (Figure 1).

Figure 1 – Top 10 States by Underground Natural Gas Storage Capacity (MMcf), 2014

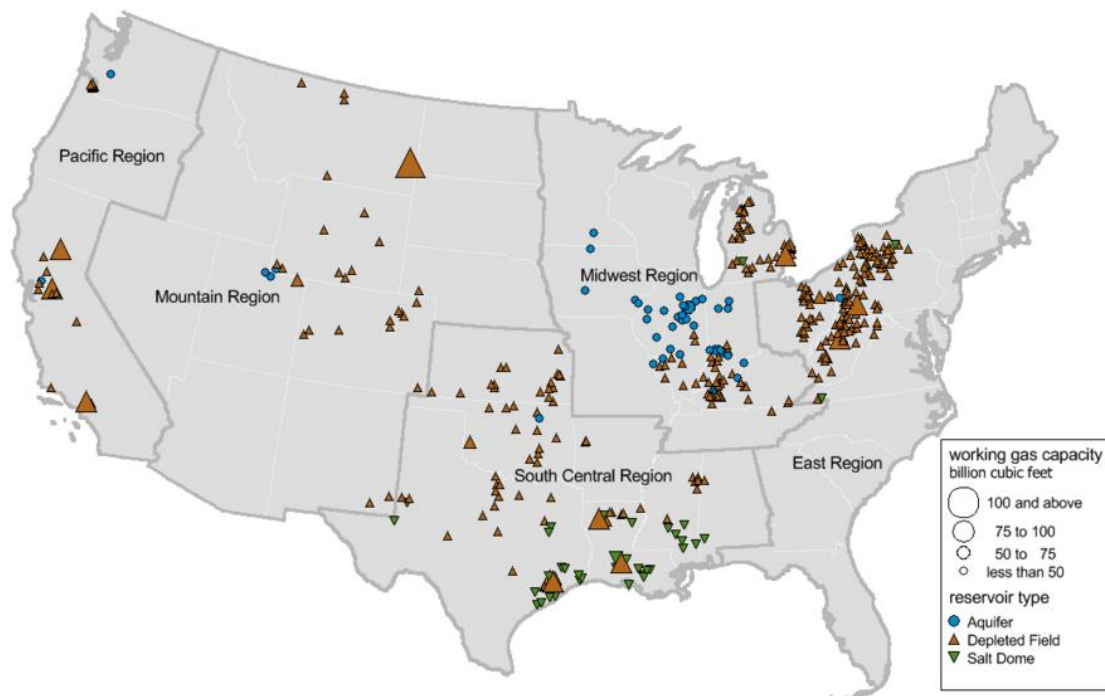


Source: EIA

The natural gas industry typically uses depleted oil and gas reservoirs, such as Aliso Canyon, to store fuel near major markets to meet fluctuating demand as it is more economic than storing gas in tanks on the surface. Storage facilities are state-regulated except those that serve interstate commerce, which are

subject to the jurisdiction of the Federal Energy Regulatory Commission (FERC). The U.S. has 418 active underground gas storage facilities (Figure 2).

Figure 2 – U.S. Underground Natural Gas Storage Facilities by Type, December 31, 2015



Source: EIA

The Aliso Canyon leak has drawn national attention to underground natural gas storage, triggering regulatory and legislative efforts to regulate these facilities at federal level.

- On January 6, three members of the U.S. House of Representatives, Reps. Frank Pallone (D-NJ), Diana DeGette (D-Colo.) and Bobby Rush (D-Ill.), wrote to the Department of Transportation (DOT) and Environmental Protection Agency (EPA) requesting a briefing on how they are involved in responding to the leak.
- On January 20, Congressman Brad Sherman (D-CA) wrote to CA PUC and CA ISO to take necessary steps to make sure that the Aliso Canyon disaster does not have an adverse impact on electric reliability this summer and offered to encourage federal agencies to take expedited action if necessary.
- On February 5, the Pipeline and Hazardous Materials Safety Administration (PHMSA) announced a new Advisory Bulletin on managing the integrity of underground natural gas storage facilities. The bulletin encouraged operators to review and implement American Petroleum Institute (API) and Interstate Oil and Gas Compact Commission (IOGCC) recommended practices.

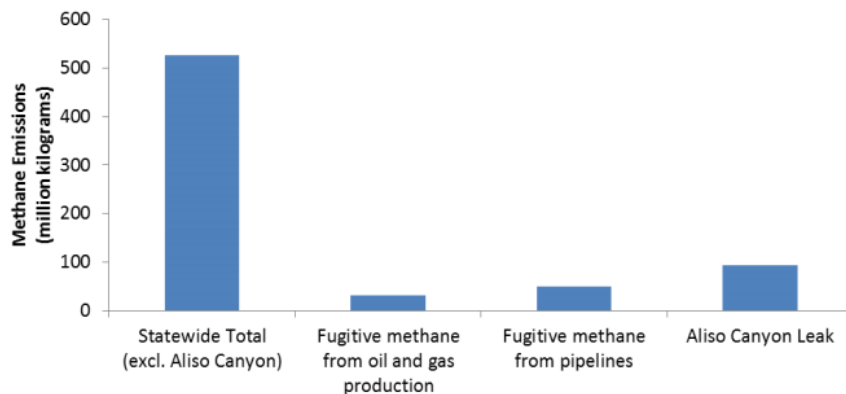
- On February 2, Rep. Stephen Knight (R-CA) introduced the Natural Gas Leak Prevention Act of 2016 (HR 4429), which would require PHMSA to create minimum standards for all storage facilities within two years.
- On February 12, Rep. Brad Sherman (D-CA) introduced the Underground Gas Storage Safety Act (HR 4578), which would require PHMSA to set federal standards within 180 days; in the meantime, operators would use the API guidelines as a stopgap measure.
- On March 3, the U.S. Senate passed the Securing America's Future Energy: Protecting our Infrastructure of Pipelines and Enhancing Safety Act (SAFE PIPES Act), S.2276, which would reauthorize appropriations for PHMSA safety programs from FY 2016 through FY 2019; call for minimum standards to ensure safety of natural gas storage facilities; and establish an Aliso Canyon working group to study and report on the recent California natural gas leak.
- On March 17, 2016, PHMSA proposed revisions to safety standards for onshore natural gas transmission and gathering pipelines, postponing regulatory requirements for automatic shut-off valves and underground storage for future rulemaking.
- On March 23, U.S. Senators Barbara Boxer (D-CA) and Dianne Feinstein (D-CA) wrote to President Obama requesting a multi-agency task force led by DOE to investigate the cause and effects of the Aliso Canyon incident and make recommendations to prevent similar incidents. The Senators' amendment to establish an Aliso Canyon task force unanimously passed the Senate as part of the SAFE PIPES Act and was included in the Energy Policy Modernization Act.
- On April 1, DOE and PHMSA announced a new Interagency Task Force on Natural Gas Storage Safety. DOE will hold workshops with industry, state and local leaders, and other stakeholders to support the development of best practices to ensure well integrity and proper response plans, safe operations of storage facilities, and assess potential reliability risks from loss of use of storage facilities. The findings from the Task Force will be made public later this year to help states and companies prevent future incidents.

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California Air Resources Board Issues Climate Mitigation Program to Eliminate the Environmental Impacts of the Leak

While much of the multi-agency response has been focused on immediate measures, the California Air Resources Board (CARB) is tasked with implementing climate mitigation measures to address environmental impacts long after the leak is over. CARB's preliminary measurements suggest a total of 94,500 tons of methane was released from the leak, representing an approximately 20 percent increase in statewide methane emissions for the duration of the leak (Figure 3).

Figure 3 – Methane Emissions in California October 23, 2015 to February 17, 2016



Source: CARB

CARB recommendations emphasize projects that reduce methane emissions in the agriculture and waste sectors, which account for approximately three-quarters of statewide methane emissions. The program recommends addressing short-lived climate pollutants (SLCPs) and other greenhouse gases through projects that enhance California’s energy infrastructure by decreasing reliance on fossil fuels and promoting energy efficiency and renewable energy resources. Finally, CARB recommends building on current efforts to identify and control previously unrecognized or unresolved sources of methane, such as abating leaks at high-emission methane hot spots like abandoned oil and gas wells.

In addition to stronger regulations, policymakers are calling for an expedited shift from fossil fuels to renewable energy sources. For example, in introducing SB 380 that seeks to extend existing moratorium on injections into the Aliso Canyon facility, Sen. Fran Pavley indicated that the incident, coupled with the vulnerability of the energy system’s reliance on fossil fuels, underscores the urgency to transition to clean, renewable energy sources. He suggested steps to CARB to promote conservation and renewable energy as part of a comprehensive plan to mitigate the climate-polluting methane releases from the Aliso Canyon leak.

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Legislation to Address Aging Infrastructure and Decrease Operational Risks at State and Federal Levels Likely to Improve Safety

The possibility of electricity interruptions after the Aliso Canyon incident indicates both Southern California’s heavy reliance on natural gas as well as shortcomings in California’s oil and gas oversight. The impact of the leak could be a longer-term issue, with the potential to create price spikes next winter if the field does not return to operations. Although natural gas storage is critical for the economy and grid resilience in the transition to a low-carbon future, the impact of the California incident exposes the possibility of inadequate oversight of approximately 400 underground natural gas storage facilities in the U.S., most of which are regulated by states.

Nationwide, natural gas storage capacity has increased steadily over the past decade due to the rapid growth in natural gas production facilitated by hydraulic fracturing. The severity and duration of the Aliso Canyon incident illustrates the risks associated with underground gas storage facilities and the importance of proactive measures to identify and mitigate those risks. The incident also highlights the increasing risks of leaks and explosions from aging pipelines and storage facilities in the U.S., as natural gas continues to supplant coal as the dominant energy source and complement renewable generation for load-balancing purposes.

Moving forward, an approach to resolve the issue hinges on legislation to address proper storage of natural gas underground. The issue underscores the significance of state actions to proactively address aging infrastructure concerns, identify technology advancements, and enhance operating procedures. National attention could bolster the administration's recent proposal to curb methane emissions, potentially leading to more discussion on the future of fossil fuel extraction. In August 2015, EPA proposed the first national standards for methane emissions from new and modified sources in the oil and gas sector. However, environmentalists continue to emphasize the need to expand the regulations to existing sources. If PHMSA issues underground natural gas storage rules, new regulations would apply to federally regulated storage facilities – that serve interstate pipelines – and would set a national standard that states have to meet or exceed in regulating storage facilities that serve intrastate pipelines. Finally, initial reactions from state regulators in other states with high storage capacities, such as Michigan, could lead to tightened regulations in other states, making the ripple effect from Aliso Canyon felt much farther than just within California.

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Disclosures Section

RESEARCH RISKS

Regulatory and Legislative agendas are subject to change.

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