



# STUDY

## Gas Leak Burden on U.S. Fire Departments

### BACKGROUND

Fire departments play a critical role in responding to gas leaks and gas-leak-related hazards, such as fires and explosions. A study from PSE Healthy Energy, published in the peer-reviewed journal *Energy Policy*, analyzes 15 years of gas leak incidents and estimates the burden gas leaks place on fire departments across the U.S. The findings show that gas leak incident responses have steadily increased nationwide, nearly quadrupling from 2003 to 2018. During this period, a total of 2.4 million gas leak incidents required fire department response. Across the U.S., these incidents conservatively costs fire departments \$564 million in 2018. That year, New York City experienced 22,090 gas leak incidents—more than the next 25 cities combined—conservatively costing the New York Fire Department \$70 million.

Researchers found that the median cost to respond to a single uncombusted gas leak was \$2,609, when including fire department overhead. Uncombusted gas leaks were found to be roughly 600 times more frequent than fires started by gas leaks. As a result, they make up a significantly larger share of the cost to fire departments each year. However, responding to gas leaks that do ignite and cause fires is estimated to be about 10 times more costly per incident. These findings highlight the under appreciated and increasing public cost burden that gas leaks place on emergency response services. The researchers recommend steps to improve coordination between utilities and first responders, as well as further consideration of the cost to fire department posed by gas leaks within energy policy.

### METHODS

Researchers analyzed 15 years of fire department emergency responses coded as natural gas leak incidents using the Federal Emergency Management Agency's (FEMA's) National Fire Incident Reporting System (NFIRS) ], as well as city-level data acquired directly from the Boston Fire Department (BFD) and Philadelphia Fire Department (PFD).

Researchers then estimate the systemic burden, including overhead, of natural gas leaks on fire departments using publicly-available data on fire department operating budgets for the top 20 cities reporting the most gas leak incidents.

## KEY FINDINGS

**Responding to gas leaks costs U.S. fire departments nearly half a billion dollars each year—not including leaks that ignite.** Scientists analyzed emergency response data from 75% of fire departments across the U.S. Among the 20 cities with the most leak responses, the median cost for responding to a single leak was \$2,609. Across these cities, the total cost of gas leak responses represented 0.3 to 9% of their total operating budget. They found that uncombusted gas leaks conservatively cost U.S. fire departments \$564 million in 2018.

### *Why it Matters:*

- Gas leaks represent a significant financial cost to fire departments and divert time and resources away from other critical emergencies.
- The financial cost to fire departments is almost certainly an underestimate given that roughly 25% of fire departments across the U.S. were not included in the study.
- Burdens are also influenced by policies and education about who is responsible for the first-line response to gas leaks. For example, in 2014 New York City implemented a policy whereby gas complaints to 311 were automatically routed to fire departments, which contributed to a 50% increase in gas leak responses from 2013 to 2014.

**The number of gas leak incidents nearly quadrupled between 2003 to 2018.** Between 2003 to 2018, at least 2.4 million gas leak incidents required fire department response. While the cause of this increase was not studied, it is clear that city-level natural gas systems represent an underappreciated and increasing burden on taxpayers and emergency response services.

### *Why it Matters:*

- Approximately 4,200 home fires are ignited by a natural gas source annually. Meanwhile, small gas leaks can go undetected, creating the potential for prolonged exposure to health-damaging air pollutants, such as benzene.
- A rising gas leak burden may compete with other demands on fire departments, including wildfires, extreme weather, and drug-related incidents.
- Gas leak responses can be the result of a recurring leaks. In Boston and Philadelphia, 12% and 8% of incidents were from residences that experienced multiple gas leaks over the study period.

## KEY FINDINGS

**Gas leak responses in total are at least 600 times more frequent and at least 10 times more costly than gas leak-caused fires responses.** Gas leaks from household appliances are widespread, leading to a much higher frequency of fire department responses to unignited gas leaks than ignited leaks. While responding to a gas-leak-caused fire is much more costly than an unignited leak, their higher frequency means that they pose a greater total burden, even after taking into account the potential for extremely large fires. Gas leak responses can also be the result of a recurring leak. For instance, in Boston and Philadelphia 12% and 8% of responses came from residences that experienced multiple gas leaks over nine or eight years.

### *Why it Matters:*

- The natural gas system places significant financial and opportunity costs on fire departments and emergency responders, and these costs are largely ignored.
- Given the widespread prevalence of gas leaks and public safety consequences of ignited leaks, the need for leak prevention and risk management is baked into the natural gas system - and these findings illustrate how fire departments are helping to cover this need.
- Additionally, fire departments face other costs associated with gas use - carbon monoxide related emergencies, false alarm odor calls, and the potential for injury.
- These costs should be accounted for and addressed within relevant public policy, such as building electrification laws, gas leak reporting requirements, and emergency response protocols.

# REGIONAL INSIGHTS

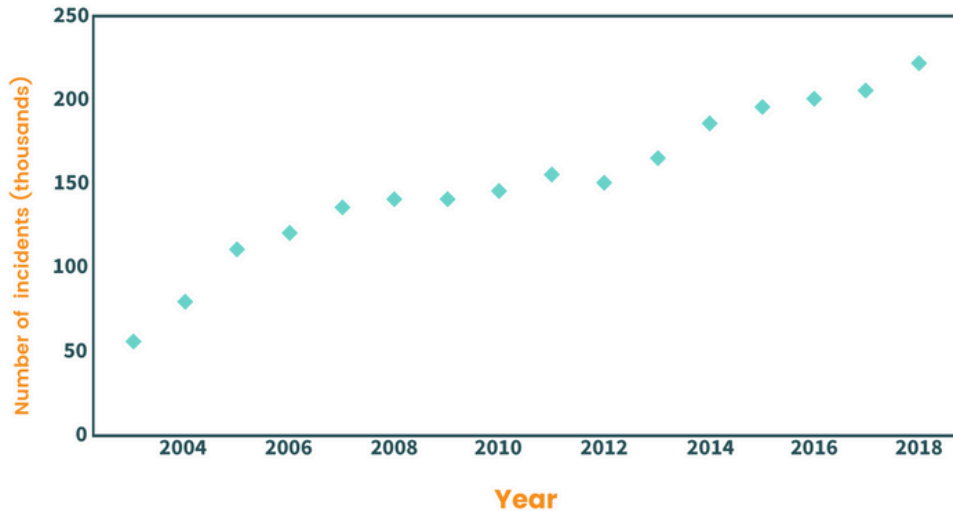
The table below shows a) the frequency of '412' incidents for the 20 cities in the U.S. with the most '412' incidents in 2018 and b) the cost of a single '412' incident, as well as the annual cost of all '412' incidents, based on the study's operating budget cost model. Incident volumes are from FEMA NFIRS, and annual operating budgets are publicly available on city websites.

City, State	'412' incidents	Total incidents	% of total incidents	Annual operating budget	Cost per '412'	Annual cost of '412's
New York, NY	22,090	602,685	3.70%	\$2,091,634,000	\$3,176	\$70,147,487
Chicago, IL	5,032	298,053	1.70%	\$641,586,615	\$902	\$4,538,342
Yonkers, NY	1,453	18,548	7.80%	\$71,055,902	\$4,556	\$6,619,415
Rochester, NY	1,102	35,615	3.10%	\$44,621,150	\$1,048	\$1,154,457
Baltimore, MD	1,076	130,769	0.80%	\$267,139,955	\$2,537	\$2,729,387
Washington DC	944	85,941	1.10%	\$249,680,668	\$1,674	\$1,580,660
Los Angeles, CA	922	77,868	1.20%	\$674,270,767	\$7,445	\$6,863,846
Houston, TX	829	171,994	0.50%	\$497,336,799	\$2,682	\$2,222,981
Austin, TX	727	70,518	1.00%	\$198,478,600	\$5,027	\$3,654,774
Charlotte, NC	703	126,104	0.60%	\$124,116,425	\$2,825	\$1,985,753
El Paso, TX	675	82,737	0.80%	\$110,693,162	\$1,773	\$1,196,811
Philadelphia, PA*	664	109,731	0.60%	\$236,274,906	\$1,384	\$918,823
Dallas, TX	638	125,522	0.50%	\$305,560,925	\$2,075	\$1,323,551
Kansas City, MO	635	110,939	0.60%	\$181,748,635	\$2,097	\$1,331,590
Columbus, OH	602	147,257	0.40%	\$255,961,641	\$1,440	\$866,815
Boston, MA	570	84,778	0.70%	\$232,299,071	\$4,677	\$2,665,713
Oklahoma City, OK	506	69,864	0.70%	\$128,962,033	\$4,303	\$2,177,448
Newark, NJ	486	14,022	3.50%	\$66,314,445	\$4,508	\$2,190,917
Minneapolis, MN	482	49,284	1.00%	\$47,112,816	\$1,960	\$944,735
Atlanta, GA	473	90,945	0.50%	\$117,307,499	\$5,130	\$2,426,574

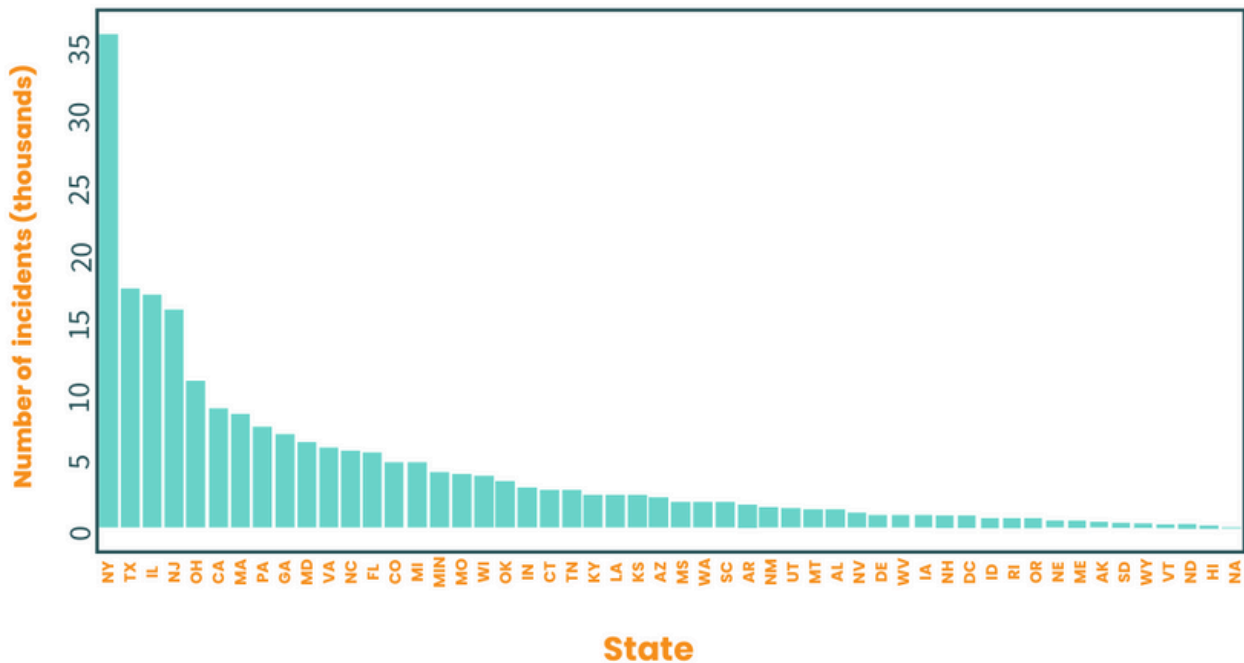
\*Philadelphia data is from 2017 because 2018 data is incomplete in FEMA NFIRS database.

# REGIONAL INSIGHTS

Across the U.S., the frequency and cost of gas leak incidents have steadily increased nationwide, nearly quadrupling from 2003 to 2018.



Cities in Northeastern and Mid-Atlantic states experienced the greatest number of gas leak incidents. New York City experienced 35,366 gas leak incidents—more than the next 25 cities combined—conservatively costing \$70 million in 2018. The state of Texas had the second highest incident rate, with fire departments responding to over 16,800 gas leaks in 2018. Other top-ranking states included Illinois, New Jersey, Ohio, California, and Massachusetts.



# CONCLUSIONS AND POLICY IMPLICATIONS

**Consider the cost of gas leaks in managing energy transitions.** Jurisdictions considering ongoing use of natural gas and those considering transitioning away from natural gas (e.g., building electrification) should consider the burdens on emergency response services and the potential co-benefits and cost savings that could be realized through energy transitions.

**Improve coordination between gas companies and emergency response.** Differing expertise, funding, and responsibilities of fire departments and gas companies should inform coordination. For example, as the entity that directly interfaces with customers, gas companies can convey the appropriate leak reporting protocol to customers. This would support matching incident severity with the appropriate initial response—either the gas company, fire department, or both.

**Full adoption of NFIRS reporting system.** NFIRS provides immense value as an emergency response evaluation tool. This study relied primarily on NFIRS and the participation of thousands of fire departments nationally. Likely, many other insights could be unlocked with this data.

# ABOUT PSE HEALTHY ENERGY

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