

# SAFETY PERFORMANCE & INTEGRITY

## OF THE NATURAL GAS DISTRIBUTION INFRASTRUCTURE: A GUIDE TO THE REPORT

### First-of-its-Kind Study Analyzes Twelve Years of Gas Distribution Incidents

**T**HE AMERICAN GAS FOUNDATION (AGF) report, *Safety Performance and Integrity of the Natural Gas Distribution Infrastructure*, provides a first-of-its-kind data analysis of serious incidents on the natural gas distribution system between 1990 and 2002, focusing on the causes of natural gas distribution incidents involving an injury or fatality.

The American Gas Foundation undertook the *Safety Performance* study in order to establish an independent technical foundation for the government and industry to use in analyzing safety performance trends, causes of incidents and possible gaps in practices or regulations along natural gas distribution systems.

Although natural gas utilities and pipeline operators have been reporting incidents on natural gas distribution pipelines to the U.S. Department of Transportation for decades, some of that data has been difficult to analyze.

By conducting an in-depth statistical evaluation of serious incidents occurring between 1990 and 2002, the *Safety Performance* study provides a more accurate picture of prevalent incident causes on the natural gas distribution system.

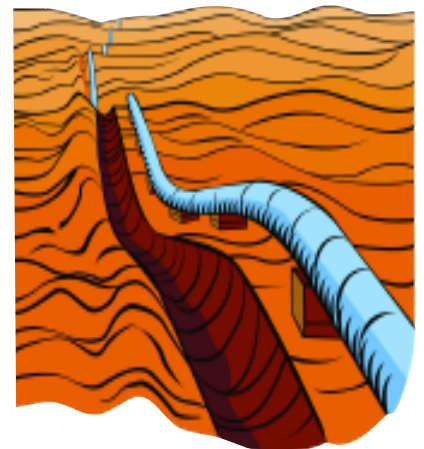
The AGF report provides a blueprint for setting priori-

ties and focusing resources where they will make the greatest impact on distribution safety.

Among the AGF report's most notable findings is that most serious incidents were the result of excavation damage by third parties. This is consistent with previous studies of natural gas distribution safety trends. The data also shows a downward trend in serious distribution incidents of approximately 40 percent in the years covering 1990 to 2002.

*Safety Performance and Integrity* includes a survey of existing industry practices and current state and federal regulations that address threats to the distribution system. Using this information, the study identifies no highly visible gaps in industry practice or regulatory oversight that may need to be addressed.

The study was sponsored by the American Gas Foundation and conducted by URS Corporation, based in Chicago. The National Association of Pipeline Safety Representatives provided information and guidance during development of the study.



## Fewer Incidents on Distribution Lines, Majority Result from Outside Force

RANGING OVER THE entire 1.9 million miles of the natural gas distribution system, there were 1,579 reported incidents over the 12-year span from 1990 to 2002. There were an average of 2.8 serious incidents per 100,000 miles of distribution pipeline between 1990 and 2002. An analysis of these incidents led researchers to several major findings:

- » The majority of incidents involved only property damage. Thirty-eight percent (601) were “serious incidents,” those involving an injury or fatality.
- » There was a statistically determined downward trend in serious incidents. The amount of the decrease is approximately 40 percent from 1990-2002.
- » Outside force damage to the infrastructure was the major cause (47 percent) of serious incidents during the study period.
- » Incidents due to construction/operating error and incidents accidentally caused by an operator each accounted for less than 10 percent of the serious incidents.
- » Corrosion caused a little over 6 percent of serious incidents.
- » Incidents characterized by operators as “Other” or “No Data” account for the remaining 27 percent of serious incidents. These may include parts of the gas delivery system that are not under jurisdiction of the pipeline safety code. This suggests the need to investigate these categories to determine exact causes and identify incidents on non-jurisdictional piping.
- » Of the total 601 serious incidents, 46 percent occurred on distribution mains, while 34 percent occurred on service lines and meter sets combined.
- » Transmission and distribution systems had essentially the same average number of serious incidents and fatalities and injuries between 1990 and 2002, when compared on a per-mile basis.

## State Regulators Say Report Is Balanced, ‘A Useful Snapshot’

THE NATIONAL ASSOCIATION of Pipeline Safety Representatives (NAPSR) contributed to the “*Safety Performance and Integrity of the Natural Gas Distribution Infrastructure*” report through its participation in a joint government-industry

task force known as the Distribution Infrastructure Government Industry Team (DIGIT). The DIGIT was tasked with assuring that concerns of state safety regulators were addressed during development of the study, that the study was balanced and that its conclusions were adequately supported.

In a letter to AGF Executive Director Gary Gardner written after the report was finalized, NAPSR National Chairman Edward M. Steele wrote, “NAPSR believes that the AGF Study, in the majority, has resulted in a balanced report with supported conclusions while addressing the concerns of safety regulators.”

The letter continues, “NAPSR believes the gap analysis in the AGF report considers only whether existing regulations or practices address all threats to distribution pipeline systems, not whether these are sufficient or broadly applied throughout the industry. The report concludes regulations and practices do exist that address all applicable threats.”

However, the NAPSR letter cautions, “While the resulting study is a useful first step, there is a need for additional work.”

And finally, the letter says, “NAPSR concludes that this study represents a useful snapshot of some of the factors that could be important in assuring the integrity of gas distribution pipeline systems.”

## Operator Programs Exceed Federal Requirements

A SURVEY OF DISTRIBUTION SAFETY practices at a representative cross-section of 23 various-sized gas utility operators provides insight into which measures they find most valuable in protecting their systems against common threats. The survey is part of the AGF *Safety Performance* report.

The survey indicates operators address threats to distribution system integrity through a combination of compliance with pipeline safety regulations and risk-based industry practices.

Operators were asked to evaluate whether each subpart of federal code for distribution pipelines (49 CFR, Part 192) corresponds with or addresses specific distribution infrastructure threats. Operators then identified which



**NAPSR concludes that this study “represents a useful snapshot of some of the factors that could be important in assuring the integrity of gas distribution pipeline systems.”**

threat each subpart of federal code addresses. Survey responses show regulatory measures and/or industry practices addressed all identified threats, often in multiple ways. An evaluation of the effectiveness of operator measures and practices was not within the scope of this study.

In addition to the federal code requirements, respondents reported half their states have issued pipeline safety regulations that exceed the requirements of nearly every subpart of federal code. Utility operators were asked to identify any prevention and mitigation (P&M) measures they employ that are in excess of federal code. Nearly all respondents indicated they exceed code in dealing with bare steel and cast-iron pipe management and many identified excavation damage prevention programs as an area in which they exceed code.

Respondents identified four industry practices currently

required by federal regulations as having the highest impact on distribution safety: cathodic protection, leak surveys, operator qualification programs and one-call systems.

### Distribution and Transmission Pipelines Differ Significantly

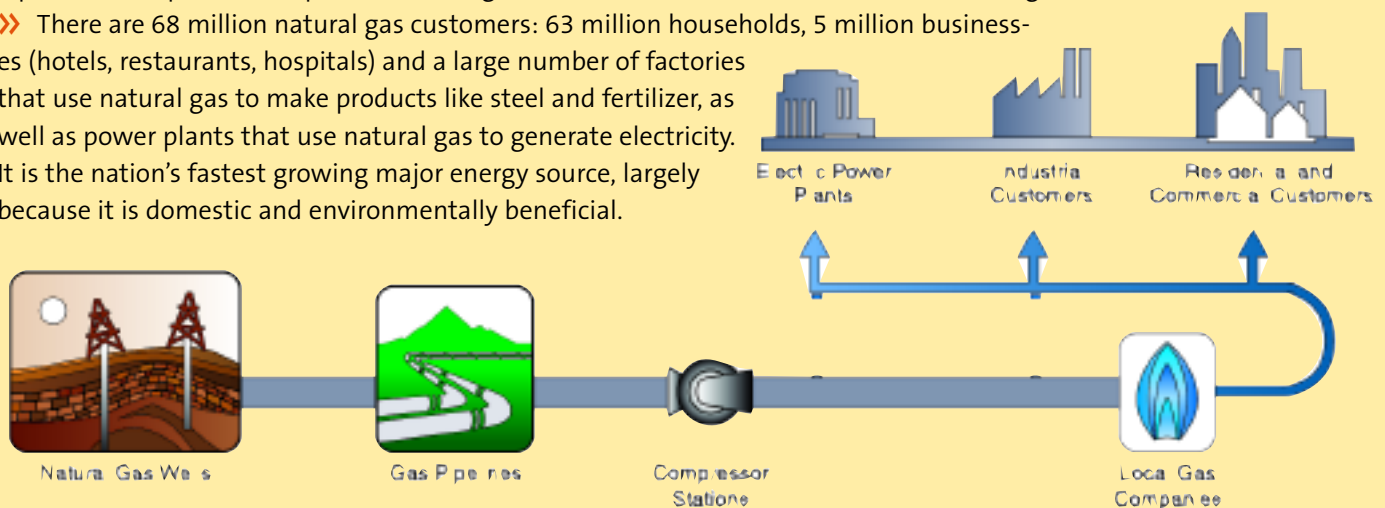
*SAFETY PERFORMANCE AND INTEGRITY* identified significant differences between transmission and distribution piping including size of pipelines, system pressures, mix and types of materials of construction, typical failure mechanisms, type and frequency of inspection, gas odorization, location of facilities and connection to customers.

Distribution pipelines are smaller in diameter and typically operate at pressures as low as 1/4 pound. City mains form a complex interconnected web of bends and turns that often mimic city streets and intersections. The most popular mate-

## Natural Gas Distribution System Is Vast — And Growing

**T**HE NATION'S NATURAL GAS delivery system is composed of 1.9 million miles of "distribution" pipeline and more than 300,000 miles of "transmission pipeline." Natural gas begins its journey at the wellhead, traveling through smaller-sized gathering pipelines that transport the gas from the wellhead to delivery hubs; then to large-diameter transmission pipelines that carry the gas at high pressure from one region of the country to another and finally, distribution pipelines, which carry the natural gas from the "city gate" through a total 1.1 million miles of city "mains" and another 800,000 miles of service lines — the small pipes that carry gas from curbside to meter.

- » Distribution pipeline mileage outnumbers transmission pipeline mileage by a ratio of six to one.
- » Distribution pipelines are regulated by federal, state and local governments. In 2002, over 1,300 distribution system operators submitted annual reports to the U.S. Department of Transportation's Office of Pipeline Safety.
- » Natural gas supplies 24 percent of all the energy used in the United States. It is a domestic energy source: 85 percent of what Americans consume annually is produced in the U.S., 12 percent comes from Canada and 3 percent is imported as liquefied natural gas from small nations such as Trinidad & Tobago.
- » There are 68 million natural gas customers: 63 million households, 5 million businesses (hotels, restaurants, hospitals) and a large number of factories that use natural gas to make products like steel and fertilizer, as well as power plants that use natural gas to generate electricity. It is the nation's fastest growing major energy source, largely because it is domestic and environmentally beneficial.



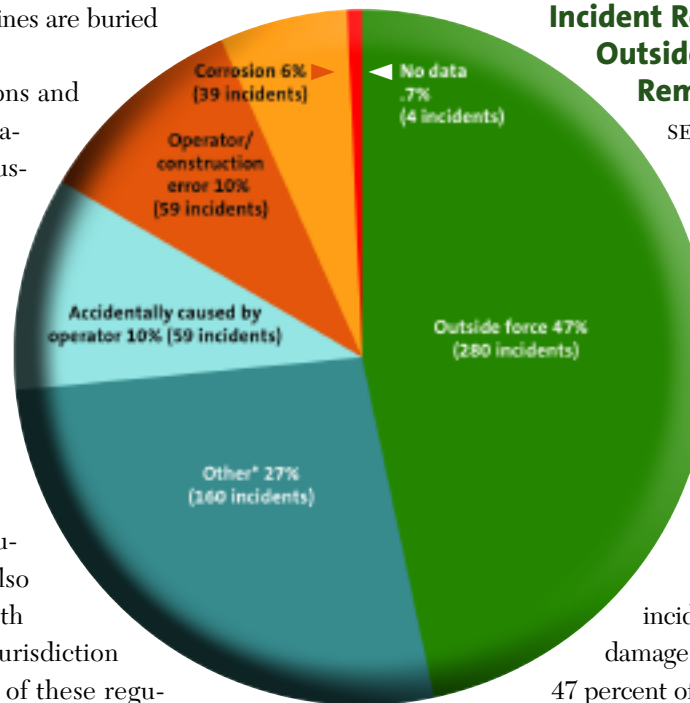
rial for distribution pipelines is plastic for its flexibility and resistance to corrosion. Gas companies add a sour smelling odorant to the gas at the city gate; most gas traveling through high-pressure, large diameter, straight transmission pipelines is not odorized. Transmission pipelines generally travel through rural areas, while distribution pipelines are buried under population centers.

On a daily basis, operations and field workers at utility companies respond to numerous customer calls reporting a suspected odor of gas. In responding to those calls, the distribution utility worker often conducts an inspection of the reported area or facility and gathers data distinctive to distribution pipelines. Because of the unique nature of distribution lines, utility operators also have frequent interaction with state safety regulators with jurisdiction over those lines. As a result of these regular interactions with customers and regulators, gas distribution facilities typically are inspected more frequently and more closely than is required by pipeline safety code.

Despite the physical and functional differences between

### Causes of Distribution Incidents 1990-2002

\*Other incidents are reported incidents that occurred on non-jurisdictional pipe, appliances or are attributed to miscellaneous causes.



natural gas transmission and distribution pipe, the study showed that transmission and distribution systems had essentially the same number of serious incidents and fatalities and injuries between 1990 and 2002, when compared on a per-mile basis.

### Incident Reports Show Outside Force Damage Remains Biggest Threat

SERIOUS INCIDENTS ACCOUNTED for less than 40 percent of all reported incidents on the distribution system between 1990 and 2002.

Serious incidents are defined as those involving an injury or fatality. An analysis of these incidents affords a more focused look at the causes than made possible with total incident counts.

The leading cause of serious incidents during the study period was damage by outside force, accounting for 47 percent of all serious incidents. Most of these were the result of excavation damage by a third party not related to the gas system operator — making up nearly 35 percent of the total number of serious incidents. Cast iron pipe was the only exception to this trend, showing a higher proportion of incidents related to earth movement. ■



### An American Gas Foundation Report

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**Building our energy future on a framework of facts**

Founded in 1989, the American Gas Foundation (AGF) is a 501(c)(3) organization that focuses on being an independent source of information research and programs on energy and environmental issues that affect public policy, with a particular emphasis on natural gas. The AGF has delivered key public policy reports such as *Fueling the Future*, *Meeting the Gas Supply Challenge of the Next 20 Years*, and *Natural Gas and Energy Price Volatility*. In addition to Safety Performance and Integrity of the Natural Gas Distribution Infrastructure, the AGF is scheduled to release several studies examining energy trends in 2005, including *Public Policy and Real Energy Efficiency*, and *Natural Gas Outlook to 2020*.