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How Much Natural Gas Leaks?

Lost gas proves a slippery figure for scientists, industry and government

Aug 1, 2013 | By Stephanie Paige Ogburn and ClimateWire

Snaking beneath the surface of many Eastern cities is a network of aging, cast-iron pipes carrying natural gas. The pipes, buried underground, have been shifted for decades by winter freeze-thaw cycles, and some are simply cracked from age. Because of this, some pipes leak.

Just how much gas from those older pipes and their newer replacements in the pipeline distribution system leaks out and rises into the atmosphere, though, is up for debate. Because methane, which makes up about 95 percent of the natural gas in pipelines, is about 25 times more potent as a greenhouse gas than carbon dioxide, the leakage raises a troubling climate question: How clean is natural gas?



Flickr/nouspique

The growing role of natural gas in the United States' energy mix makes it more important to quantify the leakage. If that number is significant, it could negate the climate benefit of natural gas -- measured against coal -- unless the leaks are plugged.

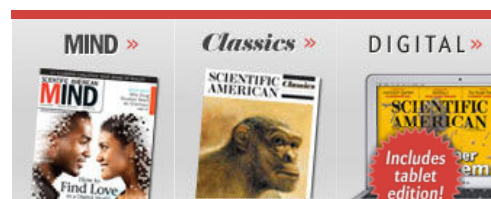
"It's outrageous and it's astounding, how little we know [about leaks]," said Nathan Phillips, a Boston University researcher who is working to figure out how much methane is leaking from cities.

Getting accurate measurements of the exact amount of gas leaking from any given city system is difficult. Phillips should know: Last year, his research team found the city of Boston's pipeline distribution system had more than 3,000 leaks.

But though they know there are a lot of leaks, they have yet to determine how much gas is coming out of them. That's what Phillips is working on now. Scientists have proposed other ways of estimating methane emissions from distribution systems, but they all suffer from significant limitations.

Cornell University researcher Robert Howarth and others have suggested using a number the government collects from every gas distribution company in the country. This metric is called "lost and unaccounted for" gas. The federal Pipeline and

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Hazardous Materials Safety Administration defines it as the difference between what the gas company sends out through its pipeline system and what gets metered at the receiving end.

Missing in action in the gas business

Say the gas company sends out 100 cubic feet of gas. Some of it might leak out of a pipe and into the soil. Cooling temperatures might make the gas contract, so the meter on the other end reads it as less gas. Some might waft through another leaky pipe out of a manhole or a crack in the asphalt, and into the atmosphere.

At the end, only 97 cubic feet get to customers. The missing 3 cubic feet? That's what industry calls "lost and unaccounted for."

According to PHMSA, there are two main reasons for this "lost" gas. The first is leaks. The second is measurement issues caused by inconsistent meters or those temperature and pressure variations that cause meters to measure more or less gas, depending on environmental conditions.

Logically, say Howarth and other researchers interested in how much methane leaks to the atmosphere, a higher lost and unaccounted for percentage would mean more gas is escaping the system and warming the planet.

"If one company reports 4 percent lost gas consistently across years and another reports 1 percent, wouldn't you expect the first company's pipelines to be responsible for more methane leakage to the atmosphere?" asked Robert Jackson, a Duke University scientist who is conducting research into methane losses from cities.

The numbers do vary, and some utilities are consistently higher than others in their percentages of lost and unaccounted for gas.

Southern California Gas Co., the largest gas distribution company in the nation, reported a 0.87 percent loss rate in 2012; in 2011, that rate was 0.84 percent. In comparison, Washington Gas Light Co., which serves the greater District of Columbia, had a 3.65 percent loss rate in 2012; in 2011 it was 4.04 percent.

Yet while there is probably some correlation between this percentage and losses to the atmosphere, it is difficult to tease out which part of that is the part that escapes, said Boston University's Phillips.

Some losses are impossible

"Right now we can't say that 'unaccounted for' means leaks," Phillips said. "It's some black box that includes leaks, accounting errors and meter errors."

Additionally, the reported numbers on lost and unaccounted for gas often seem unreliable. In 2012, PHMSA data on lost and unaccounted for rates from gas companies included a range of numbers that defied the possible.

One company, Indiana Utilities Corp., responsible for 139 miles of total pipeline, was listed as having a 563 percent lost and unaccounted for rate. Many others, mostly small systems of less than 200 pipeline miles, were listed at improbably high percentages of lost and unaccounted for gas.

In an emailed statement responding to a query on why the lost and unaccounted for numbers appeared to have so many errors, PHMSA said the responsibility for the data's accuracy lay with the reporting company.

"The accuracy of the data provided for unaccounted for gas is dependent on the operator's ability to understand how to calculate the formula. PHMSA data staff will



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be following-up with operators to verify data accuracy," the statement read.

In a telephone interview, Frank Czeschin, the president of Indiana Utilities Corp., opened up the electronic file of his 2012 report to PHMSA in order to look over his numbers.

"I just pulled my actual report, and it indicated 0.563 percent. I do not know how the report you pulled was missing the decimal," said Czeschin, who added that PHMSA had not contacted him about the supposed 563 percent loss.

Industry experts say the lost and unaccounted for rate should be no higher than 3 percent. PHMSA recommends contacting the company if the rate is more than 10 percent.

In the PHMSA database, which lists more than 1,400 gas companies, 72 companies reported lost and unaccounted for rates of 10 percent or higher. Two-hundred-and-seventy-five companies had a rate between 3 and 9.9 percent.

How much goes up? The jury remains out

The natural gas industry, represented by the American Gas Association, says the reported lost and unaccounted for percentages should not be used as a proxy for leaks. "It doesn't have anything to do with emissions or with what actually is emitted into the atmosphere," said Pamela Lacey, AGA's senior managing counsel for environment.

For its part, AGA is quick to highlight U.S. EPA's estimates of methane emissions from natural gas. EPA has said that, from the gas well to your stovetop, the industry leaks 1.4 percent of the gas it produces.

For the pipeline distribution system, the agency calculates this loss based on leak rates calculated from a 1996 study, conducted in collaboration with the Gas Research Institute (now the Gas Technology Institute). That study took leak measurements from participating gas companies for different kinds of pipes: cast iron, unprotected and protected steel, and plastic.

To determine total leaks, the agency multiplies the leak rate by the miles of pipe, subtracts any emissions reductions techniques reported by gas companies and comes up with a final emissions number. Cornell's Howarth has argued that this study underestimates emissions from natural gas.

New research to re-examine distribution system leak rates has been funded by the Environmental Defense Fund as part of a larger project to quantify lost methane from the natural gas system. Much of the field work on that is being done this year, headed up by Brian Lamb, a researcher at Washington State University.

"The whole objective of our work is to develop this database of direct emission and leak rates," said Lamb.

Another EDF-funded study is also underway in Boston, where Harvard University professor Steven Wofsy and others are working to use measurements of methane in the atmosphere above the city to determine how much of the gas is being released. They expect to publish those results in the fall.

Among these unknowns, there is one data point that is widely accepted: The pipelines will continue leaking.

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August 1, 2013, 2:54 PM

Did you ever watch someone fill a portable propane tank? They use a fill nozzle that is designed to vent pressurized gas in the hose into the atmosphere after filling every tank. Imagine how much leakage will result if all the cars ran on natural gas!

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August 1, 2013, 3:10 PM

This article is very vague because it does not take into account whether it is conventional gas or shale gas, which are obtained by very different techniques. I think that Dr. Howarth was referring about spills from the shale gas exploitation and not only the pipelines or gas distribution.

[Flag as Spam](#)**Rover911**

August 1, 2013, 3:35 PM

Interesting they are so concerned about leaks, while the major contributor to airborne methane is cow farts, as well as pig farms, etc. that probably emit more methane per year by many times over what is leaked by gas distribution systems. How about new well heads or oil exploration? Doubt the gas escaping during drilling is measured. Wish I could get a grant to study the other emission forms..

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August 1, 2013, 3:44 PM

There has been studies in Québec showing that it's a myth that cows emit more methane than shale gas and, more importantly, that it's mainly their industrial food that creates problems. But you are right about new well heads and the gas escaping during drilling (what Dr. Howarth refers to...). It is pretty scary that this data is not monitored publicly.

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August 1, 2013, 3:47 PM

I meant that if you rebalance the food from industrial stuff (lots of soya and corn) by adding flaxseed, cows emit less GHG. (experiment at the University Laval with Danone as private partner...)

[Flag as Spam](#)**Owl905** → **bebop et cie**

August 1, 2013, 4:00 PM

Dr. Howarth is not referring to fracking leaks. And the techniques of conventional natural gas (from an oil well) is the same as fracking (from a natural gas well). The traditional leak-rate from drilled wells of all kinds is 5% during the active lifetime of the well, rising to 15% over the long-term - due to degradation of containment.

The losses being studied here are the delivery system losses. While the issue is pertinent, and the study worthwhile, there is some downside to a coal comparison, because coal losses in transit haven't been added to the pollution count. Those losses include wind dust, spillage, and exposure reductions.

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August 1, 2013, 4:11 PM

"the major contributor to airborne methane is cow farts ... etc. that probably emit more methane per year by many times over what is leaked by gas distribution systems."

It's significant, but methane from fossil fuels is a larger contributor - 30% from oil & gas(41% if you add coal mining contributions), versus 23% for the entire enteric fermentation output. Those are US EPA numbers (where the affluent meat-farming sector is over-representative of global contributions). Bebop nails it - there are realistic ways to reduce that contribution. NG pipelines, coal-tailings, and stack output ... not so much.

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FilmTimelapse

August 1, 2013, 5:24 PM

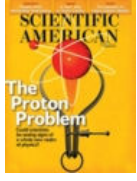
Why doesn't this article mention the huge amounts of gas leaked during collection? (during fracking, at the drill head)

When rigs explode and gas comes out for 3 days straight, I'm sure there's a significant contribution of methane and other compounds into the atmosphere.

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